STATE LIBRARY OF PENNSYLVANIA
3 0144 00524171 6

Bull.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF INTERNAL AFFAIRS

ANNOTATED BIBLIOGRAPHY OF PENNSYLVANIA GEOLOGY TO 1949

by
HOWARD ROSS CRAMER

TOPOGRAPHIC AND GEOLOGIC SURVEY
BULLETIN G 34
1961

Digitized by the Internet Archive
in 2016 with funding from
This project is made possible by a grant from the Institute of Museum and Library Services as administered by the Pennsylvania Department of Education through the Office of Commonwealth Librarie

https://archive.org/details/annotatedbibliog00cram

PENNSYLVANIA
GEOLOGICAL SURVEY
Fourth Series
BULLETIN G 34

ANNOTATED BIBLIOGRAPHY OF PENNSYLVANIA GEOLOGY TO 1949

by

HOWARD ROSS CRAMER

DEPARTMENT OF INTERNAL AFFAIRS
GENEVIEVE BLATT, *Secretary*
TOPOGRAPHIC AND GEOLOGIC SURVEY
CARLYLE GRAY, *State Geologist*
1961

PY G345/4.3 G34 c.1
Cramer, Howard Ross.
Annotated Bibliography of
Pennsylvania Geology to

ANNOTATED BIBLIOGRAPHY
OF
PENNSYLVANIA GEOLOGY
TO 1949

by

Howard Ross Cramer*

This bibliography is modeled after those of the U. S. Geological Survey, which are published annually and decennially. These bibliographies were searched for references to the state of Pennsylvania, both direct and indirect, whose bibliographies and text were searched for further references. All articles were read, annotated, and indexed.

The indexing generally included three or more categories, depending upon the nature of the material. The three common headings are subject, county, and stratigraphic interval, if pertinent. The county indices are further subdivided into categories: *Areal geology* refers to articles which cover the entire geologic aspect of a given area; *Economic geology* and *Ground water* are more or less self-explanatory; *Historical geology* is roughly synonomous with stratigraphy; *Maps, Mineralogy* and *Paleontology* cover their respective areas. *Petrology* is almost exclusively igneous petrology, although not completely; *Physical geology* is about the same as dynamic, or process geology, and *Physiography* includes glacial geology as well as surface features and their origins.

While the geographic boundaries of the bibliography are securely fixed, the subject boundaries are often very nebulous. Every geologist knows that mineralogy merges into chemistry, paleontology into biology, geophysics into mathematics, and physiography into geography. The reader will have to depend upon my judgment with regard to such boundaries. I have tried to include all articles dealing with the discussions of rocks, minerals, and fossils, etc., *per se,* and no attempt has been made to include mineral economics, chemistry, or mining engineering and the like, unless there is direct application to geological interpretation or information.

Every effort has been made to catalog every article into one or more counties, but some discussions do not lend themselves well to such definite consideration. For these cases, the Commonwealth has been divided into geographic areas which are outlined on the map in fig. 1. These are indexed with the same subheadings as have the counties.

---

* Assistant Professor, Department of Geology, Emory University, Atlanta, Georgia, and Co-operating Geologist, Bureau of Topographic and Geologic Survey, Department of Internal Affairs.

Furthermore, many prominent physiographic features have been known by many different names in the past. I have tried to standardize these for purposes of this bibliography at least. These features, as they are used in this bibliography, are also outlined and labeled on the map.

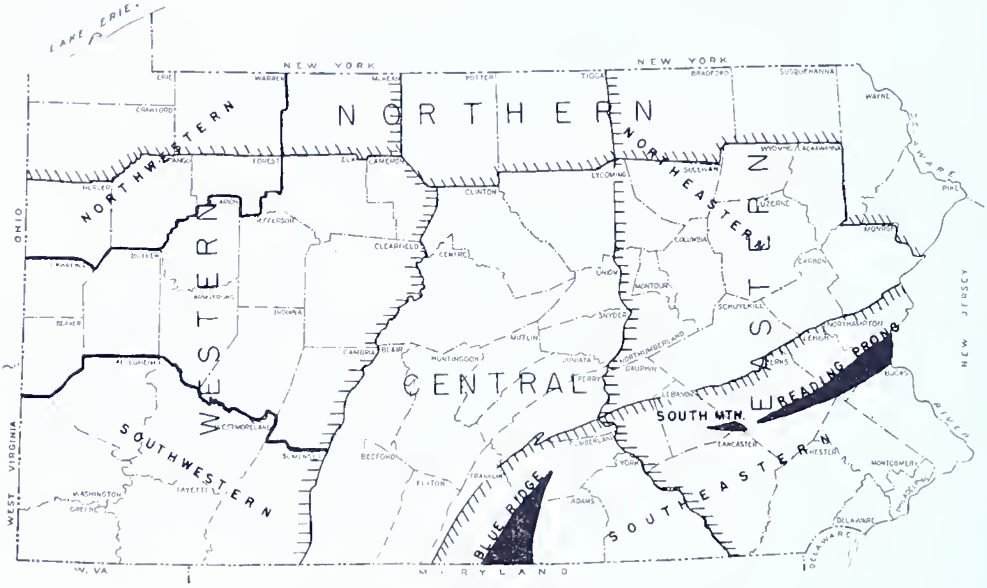

Fig. 1. Index map

Needless to say, few people can do a work of this nature without the assistance of many other people, and I am no exception. It is a genuine pleasure to acknowledge the assistance of the following persons: Mrs. Ruth King, of the U. S. Geological Survey, provided me with the inspiration and technique necessary to do this bibliography, and to her goes most of the credit. The librarian of the U. S. Geological Survey, Mr. William Heers; of Franklin and Marshall College, Mr. Herbert Anstaett; and of the Academy of Natural Sciences of Philadelphia, Mrs. Venia Phillips, were all generous in providing me with special library privileges. Dr. Horace Richards of the Academy was most helpful in lending me the use of his office facilities, and Miss Marie Siegrist of the Geological Society of America assisted me in securing some of the foreign material and in obtaining assistance from the Library of Congress.

Most bibliographies are not complete, and I have not deceived myself into thinking this is any exception. Users are urged to call to the attention of the State Geologist known references which are not in this bibliography. They can be included in a later supplement.

PUBLICATION ABBREVIATIONS

Acad. Nat. Sci. Phila., Jour.; Notulae Naturae; Proc.—Academy of Natural Sciences of Philadelphia, Journal; Notulae Naturae; Proceedings

Acad. Sci. Paris, C. R. — Académie des sciences, Paris, Comptes rendus

Acad. Sci. St. Petersburg, Mem. — Académie impériale des sciences, St. Petersburg, Memoires

Albany Inst., Trans. — Albany Institute, Transactions, New York

Amer. Acad. Arts and Sci., Mem.; Proc.—American Academy of Arts and Sciences, Memoirs; Proceedings, Boston, Mass.

Amer. Assoc. Adv. Sci., Proc. — American Association for the Advancement of Science, Proceedings, place varies

Amer. Assoc. Petroleum Geologists, Bull. — American Association of Petroleum Geologists, Bulletin, Tulsa, Okla.

Amer. Ceramic Soc., Jour. — American Ceramic Society, Journal, Easton, Pa.

Amer. Chem. Jour. — American Chemical Journal, Baltimore, Md.

Amer. Entomological Soc., Trans. — American Entomological Society, Transactions, Philadelphia, Pa.

Amer. Gas Light Jour. — American Gas Light Journal, New York

Amer. Geog. Soc., Bull.; Jour. — American Geographical Society of New York, Bulletin; Journal

Amer. Geologist — American Geologist, Minneapolis, Minn.

Amer. Geophysical Union, Trans. — American Geophysical Union, Transactions, Washington, D. C.

Amer. Inst. Mining Engineers, Bull.; Trans. — American Institute of Mining Engineers, Bulletin; Transactions, New York

Amer. Inst. Mining and Metallurgical Engineers, Bull.; Tech. Pub.; Trans. — American Institute of Mining and Metallurgical Engineers, Bulletin; Technical Publications; Transactions, New York

Amer. Jour. Agriculture and Science — American Journal of Agriculture and Science, Albany, N. Y.

Amer. Jour. Botany — American Journal of Botany, Lancaster, Pa.

Amer. Jour. Sci. — American Journal of Science, New Haven, Conn.

Amer. Manufacturer and Iron World — American Manufacturer and Iron World, Pittsburgh, Pa.

Amer. Midland Naturalist — American Midland Naturalist, Notre Dame, Ind.

Amer. Mineralogist — American Mineralogist, Menasha, Wis.

Amer. Mineralogical Jour. — American Mineralogical Journal, New York

Amer. Mus. Jour. — American Museum Journal, New York

American Mus. Novitates—American Museum Novitates, New York

Amer. Mus. Nat. Hist., Bull. —American Museum of Natural History, Bulletin, New York

Amer. Naturalist — American Naturalist, Salem, Mass., and elsewhere

Amer. Phil. Soc., Proc.; Trans.; Yearbook—American Philosophical Society, Proceedings; Transactions; Yearbook, Philadelphia, Pa.

Amer. Water Works Assoc., Jour. — American Water Works Association, Journal, New York

Annalen Physik u Chemie — Annalen der Physik und Chemie, Leipzig

Annales de Geographie — Annales de Geographie, Paris

Annales des Mines, Mem. — Annales des Mines, Memoires, Paris

Annals and Mag. of Nat. Hist. — Annals and Magazine of Natural History, London

Annals of Science [Cleveland Acad. Sci.] — Annals of Science, [Cleveland Academy of Science]

Appalachia — Appalachia, Boston, Mass., and Brattleboro, Vt.

Appalachian Geol. Soc., Bull. — Appalachian Geological Society, Bulletin, Morgantown, W. Va.

Appalachian Mountain Club, Bull. — Appalachian Mountain Club, Bulletin, Boston, Mass.

Archives des sciences physiques et naturelles — Archives des sciences physiques et naturelles, Geneva

Assoc. Amer. Geog., Annals — Association of American Geographers, Annals

Assoc. Amer. Geologists, [Proc.], Rpt. — Association of American Geologists and Naturalists, [Proceedings], Reports, Philadelphia, Pa.

Athanaeum—Athanaeum, Boston, Mass.

Bartonia — Bartonia, Philadelphia, Pa.

Berg- und Hüttenmanischer Zeitung—Berg- und Hüttenmanischer Zeitung, Leipzig

Berks Co. Hist. Soc., Trans. — Berks County Historical Society, Transactions, Reading, Pa.

Boston Jour. Nat. Hist. — Boston Journal of Natural History

Boston Soc. Nat. Hist., Mem.; Proc.— Boston Society of Natural History, Memoirs; Proceedings.

British Assoc. Adv. Sci., Rpt. — British Association for the Advancement of Science, Reports, place varies

Bucks Co. Hist. Soc., Papers — Bucks County Historical Society, Papers, Doylestown, Pa.

Bull. Amer. Paleontology — Bulletins of American Paleontology, Ithaca, New York

Calif. Acad. Sci., Occasional Papers — California Academy of Sciences, Occasional Papers, San Francisco

Canadian Mining and Metallurgical Bull. — Canadian Mining and Metallurgical Bulletin, Montreal, Que.

Canadian Naturalist — Canadian Naturalist and Geologist and Proceedings of the Natural History Society of Montreal

Canadian Record of Sci. — Canadian Record of Science, Montreal, Que.

Carnegie Inst. Tech., Coal-Mining Bull.; Mining and Metallurgical Inv. Bull.; Coop. Bull. — Carnegie Institute of Technology, Coal-Mining Bulletin; Mining and Metallurgical Investigations Bulletin; Cooperative Bulletin, Pittsburgh, Pa.

Carnegie Inst. Washington, Pub. — Carnegie Institute of Washington, Publications, Washington, D. C.

Carnegie Museum, Annals — Carnegie Museum, Annals, Pittsburgh, Pa.

Central Mining Inst. Western Pa., Jour. — Central Mining Institute of Western Pennsylvania, Journal, Pittsburgh, Pa.

Century Mag. — Century Illustrated Monthly Magazine, New York

Chronica Botanica — Chronica Botanica, Waltham, Mass.

Cincinnati Soc. Nat. Hist., Jour. — Cincinnati Society of Natural History, Journal

Cleveland Acad. Nat. Sci., Proc. — Cleveland Academy of Natural Science, Proceedings

Coal Age — Coal Age, New York

Coal Trade Bulletin — Coal Trade Bulletin, Pittsburgh, Pa.

Colliery Engineer — Colliery Engineer, Scranton, Pa.

Columbia Univ., School of Mines Quarterly — Columbia University School of Mines Quarterly, New York

Columbian Chem. Soc. Phila., Mem. — Columbian Chemical Society of Philadelphia, Memoirs
Compass — The Compass, Lincoln, Neb.
Denison Univ., [Bull.] Science Lab., Jour. — Denison University, [Bulletin of the] Scientific Laboratories, Journal, Granville, Ohio
Deutsche geol. Gesell., Zeitschr. — Deutsche geologische Gesellschaft, Zeitschrift, Berlin
Ecological Monographs—Ecological Monographs, Durham, No. Car.
Economic Geology — Economic Geology, Lancaster, Pa.
Elisha Mitchell Sci. Soc., Jour. — Elisha Mitchell Scientific Society, Journal, Chapel Hill, No. Car.
Engineering and Mining Jour. — Engineering and Mining Journal, New York
Engineering and Mining Jour. Press — Engineering and Mining Journal-Press, New York
Engineering Soc. York, Pa., Proc. — Engineering Society of York, Proceedings, York, Pa.
Engineers' Club of Lehigh Valley, Proc.—Engineers' Club of Lehigh Valley, Proceedings, Bethlehem, Pa.
Engineers' Club of Philadelphia, Proc. — Engineers' Club of Philadelphia, Proceedings
Engineers' Soc. Western Pa., Proc. — Engineers' Society of Western Pennsylvania, Proceedings, Pittsburgh, Pa.
Essex Inst., Bull. — Essex Institute, Bulletin, Salem, Mass.
Explosives Engineer — Explosives Engineer, Wilmington, Del.
Field Conf. of Pa. Geologists — Field Conference of Pennsylvania Geologists, place varies
Franklin Inst., Jour. — Franklin Institute, Journal, Philadelphia, Pa.
Fuel — Fuel, Chicago, Ill.
Gas-age Record—Gas-age Record, New York
Geog. Soc. Phila., Bull. — Geographical Society of Philadelphia, Bulletin
Geografiska Sallskapets i Finland, Argang — Geografiska Sallskapets i Finland, Argang, Helsingfors
Geographic Review — Geographical Review, New York
Geol. Bull. Nederlandsche Mijngebeid, Heerlen, Jaarverslag—Geologische Bulletin den Nederlandsche Mijngebeid, Heerlen, Jaarverslag
Geol. Foreningens i Stockholm, Forh. — Geologiska Foreningens i Stockholm, Forhandlingar
Geol. Rundschau — Geologische Rundschau, Leipzig
Geol. Soc. Amer., Bull.; Proc.; Special Papers — Geological Society of America, Bulletin; Proceedings; Special Papers, New York
Geol. Soc. London, Proc.; Quarterly Jour. — Geological Society of London, Proceedings; Quarterly Journal
Geol. Soc. Oregon Country, Geol. News Letter — Geological Society of the Oregon Country, Geological News Letter, Portland, Oregon.
Geol. Soc. Pa., Trans. — Geological Society of Pennsylvania, Transactions, Philadelphia, Pa.
Geological Mag. — Geological Magazine, London
Geophysics — Geophysics, Austin, Texas
Gerlands Beitr. Geophysik — Beitrage zur Geophysik, Leipzig

Gesell. Erdkunde Berlin, Zeitschr. — Gesellschaft fur Erdekunde zu Berlin, Zeitschrift

Harper's Mag. — Harper's New Monthly Magazine, New York

Harvard Coll., Mus. Comp. Zool., Mem. — Harvard College Museum of Comparative Zoology, Memoirs, Cambridge, Mass.

Harvard Univ., Botanical Museum, Leaflets — Harvard University Botanical Museum, Leaflets, Cambridge, Mass.

Hist. Soc. Schuylkill Co., Pub. — Historical Society of Schuylkill County, Publications, Pottsville, Pa.

Ill. State Geol. Survey, Bull.; Rpt. Inv. — Illinois State Geological Survey, Bulletins; Reports of Investigations, Urbana, Ill.

Ill. State Museum Nat. Hist., Bull. — Illinois State Museum of Natural History, Bulletin, Springfield, Ill.

Industrial and Engineering Chem., Jour. — Industrial and Engineering Chemistry, Journal, Easton, Pa.

Internatl. Review — International Review, New York

Iowa Acad. Sci., Proc. — Iowa Academy of Science, Proceedings, Des Moines, Iowa

Iron and Steel Inst., Jour. — Iron and Steel Institute, Journal, London

Japan Geol. Soc., Bull. — Geological Society of Japan, Bulletin, Tokyo

Johns Hopkins Univ., Circ. — Johns Hopkins University, Circulars, Baltimore, Md.

Jour. Anal. Applied Chem. — Journal of Analytical and Applied Chemistry, Easton, Pa.

Jour. Analyt. Chem. — Journal of Analytical Chemistry, Easton, Pa.

Jour. Geology — Journal of Geology, Chicago, Ill.

Jour. Geomorphology — Journal of Geomorphology, New York

Jour. Paleontology — Journal of Paleontology, Menasha, Wis.

Jour. prak. Chemie—Journal fur praktische Chemie, Leipzig

Jour. Sedimentary Petrology — Journal of Sedimentary Petrology, Menasha, Wis.

K. Nederlandsch. Aardryksk. Genootschoop Amsterdam, Tydschr. — Koniglichen Nederlandsch Aardijkskundig Genootschoop Amsterdam, Tijdschrift

Kaiserl. Akad. Wissenschaften, Math-Nat. Klasse, Sitzungsb.—Kaiserliche Akademie der Wissenschaften, mathematische-naturwissenschaftliche Klasse, Sitzungsberichte, Vienna

Kans. Acad. Sci., Trans. — Kansas Academy of Science, Transactions, Topeka, Kans.

Konigl. preuss. Akad. Wiss. Berlin, Monatsb.; Sitzungsb.—Koeniglich-preussische Akademie der Wissenschaften zu Berlin, Monatsberichte; Sitzungsberichte

Ky. Acad. Sci., Trans. — Kentucky Academy of Sciences, Transactions, Lexington, Ky.

Ky. Geol. Survey, Mem. — Kentucky Geological Survey, Memoirs, Frankfort, Ky.

Ky. Geol. Survey 1854-60, Rpt. — Kentucky Geological Survey, 1854-1860, Reports, Frankfort, Ky.

Lackawanna Inst. Hist. Sci., Proc. — Lackawanna Institute of History and Science, Proceedings, Scranton, Pa

Lake Superior Mining Inst., Proc. — Lake Superior Mining Institute, Proceedings, Ishpeming, Mich.
Lancaster Co. Hist. Soc., — Lancaster County Historical Society, Lancaster, Pa.
Lehigh Co. Hist. Soc., Proc. — Lehigh County Historical Society, Proceedings, Allentown, Pa.
Lehigh Univ., Inst. Research. Circ.— Lehigh University Institute of Research, Circular, Bethlehem, Pa.
Liverpool Geol. Soc., Proc. — Liverpool Geological Society, Proceedings
Lycaeum of Nat. Hist. New York, Annals; Proc. — Lycaeum of Natural History of New York, Annals; Proceedings, Albany, N. Y.
Mag. Nat. Hist. — Magazine of Natural History, London
Md. Geol. Survey — Maryland Geological Survey, Baltimore, Md.
Medical Repository — Medical Repository, New York
Medical Soc. Pa., Trans. — Medical Society of the State of Pennsylvania, Transactions, Philadelphia, Pa.
Mich. Acad. Sci., Papers — Michigan Academy of Arts, Science, and Letters, Papers, Ann Arbor, Mich.
Mich. Univ. Museum Paleontology, Contrib. — Michigan University Museum of Paleontology, Contributions, Ann Arbor, Mich.
Mineracao e Metalurgia — Mineraco e Metalurgia, Rio de Janiero
Mineral Collector — Mineral Collector, New York
Mineralogical Mag. — Mineralogical Magazine and Journal of the Mineralogical Society, London
Mineralogische Mitth. — Mineralogische Mittheilungen, Vienna
Mineralogist — The Mineralogist, Portland, Oregon
Mineralogy and Geol. Sec., Proc. — Mineralogy and Geology Section [of the Academy of Natural Sciences of Philadelphia], Proceedings
Mines and Minerals — Mines and Minerals, Scranton, Pa.
Mines Mag. — Mines Magazine, Denver, Colo.
Mining and Engineering World — Mining and Engineering World, Chicago, Ill.
Mining and Metallurgical Soc. Amer., Bull. — Mining and Metallurgical Society of America, Bulletin, New York
Mining and Metallurgy — Mining and Metallurgy, New York
Mining and Statistics Mag. — Mining and Statistics Magazine, *see* Mining Magazine
Mining Bull. — Mining Bulletin, State College, Pa.
Mining Cong. Jour. — Mining Congress Journal, Washington, D. C.
Mining Engineering — Mining Engineering, New York
Mining Inst. Scotland, Trans. — Mining Inst. Scotland, Transactions, Edinburgh
Mining Mag. — Mining Magazine, New York
Mining Mag. — Mining Magazine, London
Mining Mag. and Jour. Geol. — Mining Magazine and Journal of Geology, New York
Mining Sci. — Mining Science, Denver, Colo.
Mining Science-Press — Mining and Scientific-Press, San Francisco, Cal.
Mining World — Mining World, Chicago, Ill.
Minn. Acad. Nat. Sci., Bull. — Minnesota Academy of Natural Science, Bulletin, Minneapolis, Minn.

Minn. Geol. Survey, Ann. Rpt. — Minnesota Geological Survey, Annual Report, Minneapolis, Minn.

Monthly Amer. Jour. Geology — Monthly American Journal of Geology and Natural Science, Philadelphia, Pa.

Nat. Gas Jour.—Natural Gas Journal, Buffalo, N. Y.

Nat. Hist. Soc. New Brunswick, Bull. — Natural History Society of New Brunswick, Bulletin, St. John

Natl. Acad. Sci., Biog. Mem.; Proc. — National Academy of Sciences, Biographical Memoir; Proceedings, Washington, D. C.

Natl. Geog. Mag. — National Geographic Magazine, Washington, D. C.

Natl. Geog. Soc., Mon. — National Geographic Society, Monographs, Washington, D. C.

Natl. Oil Scouts and Landsmen's Assoc., Yearb. — National Oil Scouts and Landsmen's Association, Yearbook, Austin, Texas

Natural Gas Assoc. Amer., Proc. — Natural Gas Association of America, Proceedings, Easton, Pa.

Natural History — Natural History, New York

Natural Science — Natural Science, London

Nature — Nature, London

Nature — Nature, Washington, D. C.

Naturw. Verein Neuvorpommern und Rugen in Griefswald, Mitth. — Naturwissenschaftlicher Verein fur Neuvorpommern und Rugen in Griefswald, Mittheilungen

Neues Jahrb. — *see* next entry

Neues Jahrb. Mineralogie, Geologie, u Paleontologie — Neues Jahrbuch fur Mineralogie, Geologie, und Paleontologie, Stuttgart

Neues Jahrb. Mineralogie, Geognosie, u Geol. — Neues Jahrbuch fur Mineralogie, Geognosie, und Geologie, Heidelberg and Stuttgart

New Jersey Geol. Survey, Ann. Rpt. — New Jersey Geological Survey, Annual Report, Trenton, N. J.

New York Acad. Sci., Annals; Trans. — New York Academy of Sciences, Annals; Transactions, New York

New York State Museum, Ann. Rpt.; Bull.; Mem. — New York State Museum, Annual Report; Bulletin; Memoirs, Albany, N. Y.

New York Univ., Regents Bull. — New York University, Regents Bulletin, Albany, N. Y.

Nordamerikanischer Monatsberichte — Nordamerikanischer Monatsberichte, Philadelphia, Pa.

North of England Inst. Mining Engineers, Trans. — North of England Institute of Mining Engineers, Transactions, Newcastle-on-Tyne

Ohio Acad. Sci., Proc. — Ohio Academy of Sciences, Proceedings, Columbus, Ohio

Ohio Jour. Sci. — Ohio Journal of Science, Columbus, Ohio

Ohio Mining Jour. — Ohio Mining Journal, Columbus, Ohio

Oil and Gas Jour. — Oil and Gas Journal, Tulsa, Okla.

Oil Weekly — Oil Weekly, Houston, Texas

Ottawa Naturalist — The Ottawa Naturalist

Pa. Acad. Sci., Trans. — Pennsylvania Academy of Sciences, Transactions, Harrisburg, Pa.

Pa. Agriculture Experiment Sta., Bull. — Pennsylvania Agricultural Experiment Station Bulletin, State College, Pa.
Pa. Dept. Agriculture, Ann. Rpt.; Bull. — Pennsylvania Department of Agriculture, Annual Report; Bulletins, Harrisburg, Pa.
Pa. Dept. Internal Affairs, Monthly Bull. — Pennsylvania Department of Internal Affairs, Monthly Bulletin, Harrisburg, Pa.
Pa. Geol. Survey — Pennsylvania Geological Survey, (four different ones)
Pa. State College, Agric. Experiment Sta., Bull. — Pennsylvania State College Agricultural Experiment Station, Bulletin, State College, Pa.
Pa. State College, Ann. Rpt. — Pennsylvania State College, Annual Report, State College, Pa.
Pa. State College, Mineral Industries Experiment Sta., Bull. — Pennsylvania State College Mineral Industries Experiment Station, Bulletin, State College, Pa.
Palaeontographica Americana — Palaeontographica Americana, Ithaca, New York
Paleontological Bull. — Paleontological Bulletin, Philadelphia, Pa.
Pan-Amer. Geologist — Pan-American Geologist, Des Moines, Iowa
Penn State Mining Quarterly — Penn State Mining Quarterly, State College, Pa.
Petermann's geog. Mittheilungen — Petermann's geographische Mittheilungen, Gotha
Petroleum age — Petroleum age, Bradford, Pa.
Pharmaceutical Jour. — Pharmaceutical Journal and Transactions, London
Phil. Soc. Glasgow, Proc. — Philosophical Society of Glasgow, Proceedings
Phil. Soc. Washington, Bull. — Philosophical Society of Washington, Bulletin, Washington, D. C.
Phila. Medical Museum — Philadelphia Medical Museum
Phila. Medical and Physical Jour. — Philadelphia Medical and Physical Journal
Philosophical Mag. — Philosophical Magazine, England
Pit and Quarry — Pit and Quarry, Chicago, Ill.
Polytechnic Review — Polytechnic Review, Philadelphia, Pa.
Popular Astronomy — Popular Astronomy, Northfield, Minn.
Popular Science Monthly — Popular Science Monthly, New York
Portland [Me.] Soc. Nat. Hist., Proc. — Portland [Maine] Society of Natural History, Proceedings
Pottsville Science Assoc., Bull. — Pottsville Scientific Association, Bulletin, Pottsville, Pa.
Producers Monthly — Producers Monthly, Bradford, Pa.
Progressive age — Progressive age, *see* Gas age
Revue de l'industrie minerale — Revue de l'industrie minérale, Paris
Revue Universelle des Mines — Revue Universelle des Mines, Liege, Paris
Rochester Acad. Sci., Proc. — Rochester Academy of Sciences, Proceedings, Rochester, N. Y.
Rocks and Minerals — Rocks and Minerals, Peekskill, N. Y.

Roy. Geol. Soc. Ireland, Jour. — Royal Geological Society of Ireland, Journal, Dublin
Roy. Soc. Canada, Proc. and Trans. — Royal Society of Canada, Proceedings and Transactions, Montreal, Que.
Roy. Soc. Edinburgh, Trans. — Royal Society of Edinburgh, Transactions
Ruffed Grouse — Ruffed Grouse, Pittsburgh, Pa.
San Diego Soc. Nat. Hist., Trans. — San Diego Society of Natural History, Transactions
Science — Science, Cambridge, Mass., and New York
Scientific American, Supplement — Scientific American Supplement, New York
Scientific Monthly — Scientific Monthly, New York
Scottish Geog. Mag. — Scottish Geographical Magazine, Edinburgh
Senckenbergische naturforshung. Gesell., Abh. — Senckenbergische naturforschende Gesellschaft in Frankfort am Main, Abhandlungen
Smithsonian Inst., Ann. Rpt. — Smithsonian Institute, Annual Report, Washington, D. C.
Smithsonian Misc. Collections — Smithsonian Miscellaneous Collections, Washington, D. C.
Soc. Belge de Géol., Bull. — Société belge de géologie. . . . , Bulletin, Brussels
Soc. Cientifica Antonio Alzate, Mem. — Sociedad cientifica "Antonio Alzate," Memoirs y Revista, Mexico, D. F.
Soc. d'Etudes scientifique d'Angers, Bull. — Société d'études scientifiques d'Angers, Bulletin
Soc. de l'Industrie Minerale, Bull. — Société de l'Industrie minérale, Bulletin, Ste.-Etienne
Soc. géol. Belgique, Annales — Société géologique de Belgique, Annales, Liege
Soc. géol. du Nord., Ann.; Mem. — Société géologique du Nord, Annales; Memoires, Lille
Soc. géol. France, Bull. — Société géologique de la France, Bulletin, Paris
Soc. Imperiale des Naturalistes, Bull. — Société impériale des naturalistes du Moscou, Bulletin
Soc. minéralogique de France, Bull. — Société minéralogique de France, Bulletin, Paris
Stone — Stone, Chicago, Ill.
Syracuse Univ., Bull. — Syracuse University Bulletin, Syracuse, N. Y.
The Virginias — The Virginias, Staunton, Va.
Torrey Botanical Club, Bull. — Torrey Botanical Club, Bulletin, New York
U. S. Bur. Mines, Bull.; Info. Circ.; Rpt. Inv.; Tech. Paper — U. S. Bureau of Mines, Bulletin; Information Circular; Reports of Investigations; Technical Papers, Washington, D. C.
U. S. Bur. Standards, Jour. Research — U. S. Bureau of Standards, Journal of Research, Washington, D. C.

U. S. Geol. Survey, Ann Rpt.; Bull.; Geol. Atlas of U. S. folio; Mineral Resources; Mon.; Oil and Gas Prelim. Inv. Maps; Prof. Paper; Water-Supply Papers — U. S. Geological Survey, Annual Reports; Bulletins; Atlas of the U. S. folios; Mineral Resources; Monographs; Oil and Gas Preliminary Investigation Maps; Professional Papers; Water Supply Papers, Washington, D. C.

U. S. Natl. Museum, Bull.; Proc. — U. S. National Museum, Bulletins; Proceedings, Washington, D. C.

Va. Acad. Sci., Proc. — Virginia Academy of Sciences, Proceedings, Charlottesville

W.Va. Acad Sci., Proc. — West Virginia Academy of Sciences, Proceedings, Morgantown, W. Va.

W. Va. Geol. Survey, [Rpt.] — West Virginia Geological Survey, [Reports], Morgantown, W. Va.

Wagner Free Inst. Science, Bull.; Pub. — Wagner Free Institute of Science, Bulletin; Publications, Philadelphia, Pa.

Wash. Acad. Sci., Jour. — Washington Academy of Sciences, Journal, Washington, D. C.

Wyoming Hist. Geol. Soc., Quarterly Bull.; Proc. — Wyoming Historical and Geological Society, Quarterly Bulletin; Proceedings, Wilkes-Barre, Pa.

Zeitschrift fur Geomorphologie — Zeitschrift fur Geomorphologie, Leipzig

Zeitschrift fur Kristallographie — Zeitschrift fur Kristallographie und Mineralogie, Leipzig

Zeitschr. Mineralogie — Zeitschrift fur Mineralogie, Frankfort am Main

Zeitschr. praktische Geologie — Zeitschrift fur praktische Geologie, Berlin

ANNOTATED BIBLIOGRAPHY OF PENNSYLVANIA GEOLOGY TO 1949

A # indicates reproduction other than by conventional printing, usually mimeographed.

ABBEY, MARJORIE B.

1. Limestones of Chester Valley: M.A. thesis, Bryn Mawr College, 1934.

ABBOTT, CHARLES CONRAD

1. Timothy Abbott Conrad [1803-1877]: Popular Science Monthly 47, p. 257-263, port., 1895.

ABERDEEN, ESTHER JANE. See Pierce, William Gamewell, 1.

ABERNATHY, GEORGE E.

1. Some structural features of the Wier-Pittsburg coal bed: Thesis, Univ. Kansas, 1925.

ABERNATHY, R. F. See Cooper, H. M., 1, 2.

ADAIR, G. L. See Cumings, W. L., 2.

ADAMS, FRANK DAWSON

1. Biographical memoir of James Furman Kemp, 1859-1926: Natl. Acad. Sci., Biog. Mem. 16, p. 1-22, port., 1936.

ADAMS, THOMAS K.

1. Lower productive coal measures: Central Mining Inst. Western Pa., Jour. 2, p. 248-267, illus. incl. port., 1903; discussions, p. 267-268. The stratigraphic sequence of the Lower [Pennsylvanian] is described. Included are columnar sections and a structure section. Some are measured in detail.
2. Lower productive coal measures of the bituminous regions of Pennsylvania: Mines and Minerals 23, p. 348-352, illus., 1903. A review of [Pennsylvanian] stratigraphy, structure, and the associated coal is given. The importance of "practical" geology is stressed for further prospecting. This includes the recognition of physical features for correlation, etc.

ADAMSON, JOHN HOWARD, JR.

1. Collection and development of ground water: Pa. Dept. Internal Affairs, Monthly Bull. 15, no. 10, p. 15-23, 1947. A generalized, popular account of ground water with example drawn from the Commonwealth is given.
2. Ground water problem in Allegheny County: Pa. Dept. Internal Affairs, Monthly Bull. 15, no. 9, p. 16-19, 1947. This is a generalized, popular account of the ground water in the Pittsburgh area. The source, reserves, and requirements are described.
3. (and Graham, Jack Bennett and Klein, Norman H.). Ground-water resources of the valley-fill deposits of Allegheny County, Pennsylvania: Pa. Geol. Survey 4th ser., W8, 181 p. (#), illus., 1949. Supplements W1. The valley-fill deposits are the major source of ground water in the area. The valley-fill is Pleistocene and Recent in age. Quantity, quality, and temperature are discussed. Well records are given.
4. Ground water significance in Pittsburgh [Allegheny County] area: Pa. Dept. Internal Affairs, Monthly Bull. 17, no. 10, p. 26-32, 1949. This is a generalized, popular account of ground water occurrences, uses, needs, and reserves. The increased industrial use in the area is seriously affecting the level of the ground water table.

ADELHEIM, WILLIAM. See Postel, Albert Williams, 5, 6.

AGASSIZ, LOUIS. See Marcou, Jules, 4.

AGRON, SAM L.

1. Structure and petrology of the Peach Bottom slate, and its environment [Lancaster County]: Ph.D. thesis, Johns Hopkins Univ., 1949.

AGTHE, FRED T.

1. (and Dynan, John L.). Paint-ore deposits near Lehigh Gap, [Carbon County] Pennsylvania: U. S. Geol. Survey, Bull. 430, p. 440-454, illus., 1910. Impure iron-carbonate is in the Lower Devonian strata. Its origin is probably due to deposition by descending meteoric water which replaces certain shaly beds.

[AIGSTER, F.]

1. Mineralogy of the vicinity of Pittsburgh [Allegheny County]: Medical Repository ns 1 [4th ser. 1], [16], p. 211-212, 1813. [Extracted from Magazine-Almanac 1812 or 1813, published at Pittsburgh by Cramer, Spear, and Eichbaum which was not seen.]

AIKEN, WILLIAM E. A.

1. . . . geology of the country between Baltimore and the Ohio River, with a section illustrating the superposition of the rocks: Amer. Jour. Sci. 26, p. 219-232, illus., 1834. A cross-section description includes southwestern and south-central Pennsylvania. The flat-lying Carboniferous rocks are described in the west; a generalized description of the folded lower Paleozoic rocks in the south-central area is also given.

ALDEN, WILLIAM CLINTON. See also Fuller, Myron Leslie, 3, 4.

1. [Frank Leverett, 1859-1943]: Wash. Acad. Sci., Jour. 34, p. 206-207, 1944.

ALDER AND COMPANY

1. General map of the anthracite coal fields of Pennsylvania and adjoining counties showing the position of each colliery: Map, scale, 1:126, 720, or 1 inch equals 2 miles, Alder & Co., Philadelphia, 1916.

ALLEN, JOEL ASAPH

1. The American bisons, living and extinct: Harvard Coll., Mus. Comp. Zool., Mem. 4, no. 10, ix, 246 p., illus., 1876; Ky. Geol. Survey, Mem. 1, pt. 2, 246 p., illus., 1876 A complete, detailed description of this group is given. It includes those fragments found in various bone caves throughout the Commonwealth. A map shows the distribution of the group throughout the U. S.

ALTHOUSE, HARRY W.

1. The Buckstown coal fields, Berlin basin, Somerset County, Pennsylvania: Engineering and Mining Jour. 69, p. 291, illus., 1900. Pottsville-Allegheny rocks are described. The coal beds are listed, and the economic aspects are outlined.
2. Geology of the Buck Mountain coal field [Schuylkill County]: Engineering and Mining Jour. 83, p. 668-670, illus., 1907. The field is a syncline with an overturned south limb. The coal beds and limestones are described, and a cross section is given.
3. The so-called new supplies of anthracite: Engineering and Mining Jour. 84, p. 500-503, illus., 1907. A resumé of Mississippian-Pennsylvanian stratigraphy to show reasons why anthracite is not likely to be found below the Pottsville Formation. Examples in Somerset County are used to show that coal can be predicted from geological knowledge.

AMES, MARY LESLEY, ? — 1929.

1. Life and letters of Peter [1819-1903] and Susan Lesley: 2 vols., vii, 526 p., 562 p., illus., New York, 1909.

ANDERSON, WILLIAM

1. Geology [Indiana County]: Medical Soc. Pa., Trans. ns 5, p. 85-90, illus. incl. geol. map, 1860. A complete, but generalized description of the county is given. [Mississippian and Pennsylvanian] rocks are exposed. The coal beds are mapped. A mention is made of other mineral resources and fossils.

ANDREWS, EBENEZER BALDWIN, 1821-1880.

1. Rock oil, its geological relations and distribution: Amer. Jour. Sci. 2nd ser. 32, p. 85-93, 1861; Pharmaceutical Jour. 2nd ser. 4, p. 73-76, 1862. Oil is formed from coal at low temperatures and accumulates in joints and fissures. Examples are taken from the Commonwealth.
2. Petroleum in its geologic relations: Amer. Jour. Sci. 2nd ser. 42, p. 33-43, 1866. Examples are taken from the Commonwealth and elsewhere to show that petroleum occurs in fissures which are related to structures. The petroleum is trapped in the lowest fissure-bearing rock in an area.
3. Coal and its supply: International Review 1, p. 458-478, 1874. A popular account of coal fields throughout the country, including the Commonwealth.

ANNEAR, JOHN

1. Report of the New Britain lead mine, Bucks County, Pennsylvania: 6 p., Philadelphia, 1862. [not seen, see Miller, B. L., Lead and Zinc in Pennsylvania, p. 20, 1924.]

APPALACHIAN GEOLOGICAL SOCIETY

1. Oriskany sand symposium: 110 p., illus., Charleston, W. Va., 1937. Contains articles by numerous authors which are cited separately.

ARMSTRONG, ELIZABETH JEAN. See also Gordon, Samuel George, 13; Watson, Edward Hahn, 1.

1. Hybridization and shearing in banded gneisses near Philadelphia [Montgomery-Bucks Counties] [abs.]: Geol. Soc. Amer., Bull. 51, no. 12, pt. 2, p. 1989, 1940.
2. Mylonization of hybrid rocks near Philadelphia [Bucks-Montgomery Counties], Pennsylvania: Ph.D. thesis, Bryn Mawr College, 1939; Geol. Soc. Amer., Bull. 52, p. 667-693, illus. incl. geol. map, 1941. Felsic material has been injected into a plagioclase-amphibolite. Vertical, winding mylonite zones are present, cutting these rocks. The mylonite zones outline masses of less-sheared rocks. East of Wissahickon Creek, the shear zones run parallel to vertical gneissic foliation. Post-Ordovician faulting is described; folding is also described. Petrographic studies are included.

ARNOLD, CHESTER ARTHUR

1. A lycopodiaceous strobilus from the Pocono sandstone of [McKean County] Pennsylvania: Amer. Jour. Botany 20, p. 114-117, illus., 1933. An unpetrified plant fragment is described. The Pocono Formation is considered possibly Devonian in age as a result. Other plant fragments support this idea, especially from foreign areas.
2. Fossil plants from the Pocono (Oswayo) sandstone of [McKean County] Pennsylvania: Mich. Acad. Sci., Papers 17, p. 51-56, illus., 1933. Five plant fragments are discussed, including a description of *Trochophyllum breviinternodium*. These support the theory that the Pocono Formation is Upper Devonian.
3. Notes on some American species of *Lepidostrobus* [McKean County]: Amer. Jour. Botany 22, p. 23-25, 1935. A review of the genus *Lepidostrobus* and a description of *L. gallowayi* are given. It is from the Pocono sandstone, which is here interpreted as being Upper Devonian in age.
4. On seedlike structures associated with *Archaeopteris*, from the Upper Devonian of [McKean County] northern Pennsylvania: Mich. Univ. Museum Paleontology, Contrib. 4, p. 283-286, illus., 1935. Seed-like structures are described and illustrated from near Port Allegany. "It is probably from above the Chemung but below the Mississippian."
5. *Archaeopteris macilenta* and *A. sphenophyllifolia* of Lesquereux [Wyoming County] — [Part] 2 *of* Observations on fossil plants from the Devonian of eastern North America: Mich. Univ. Museum Paleontology, Contrib. 5, p. 49-56, illus., 1936. These two species are redescribed and illustrated. They are from the Catskill beds.
6. Devonian and Mississippian plant-bearing formations in eastern America. Cong. strat. carbonifère, 2nd, Heerlen 1935, C. R. 1, p. 47-62, illus., Maastricht, 1937. Plants from the Catskill and Pocono Formations are discussed stratigraphically and from an evolutionary point of view. A discussion of the Devonian-Mississippian boundary is included.
7. A possible "missing link" in the evolution of the early seed plants: Chronica Botanica 5, p. 360-362, illus., 1939. A new species of *Archaeopteris*, from the Upper Devonian of somewhere in Pennsylvania, is heterosporous. It has pteridosperm features as well as true fern features. No stratigraphic details are given.
8. *Lagenospermum imparirameum* sp. nov., a seedbearing fruitification from the Mississippian of [Schuylkill County] Pennsylvania and Virginia: Torrey Botanical Club, Bull. 66, p. 297-303, illus., 1939. Plant-bearing beds in the Pocono Formation have yielded seeds. They are described in detail and illustrated. This is the first recognition of Mississippian seeds in North America.
9. Plant remains from the Catskill delta deposits of northern Pennsylvania and southern New York, — [Part] 4 *of* Observations on fossil plants from the Devonian of eastern North America: Mich. Univ. Museum Paleontology, Contrib. 5, p. 271-314, illus., 1939. Many genera and species are described and illustrated. No interpretations are made.
10. *Psilophyton* and *Aneurophyton* in the Devonian of eastern North America: Chronica Botanica 6, p. 375-376, 1941. *Aneurophyton* is abundant and wide-

spread. It ranges from Marcellus rocks to the Portage Formation. There are no details nor specific locations given in this generalized discussion of the stratigraphic, taxonomic, and geographic distribution of the two genera.

ARNOLD, RALPH

1. The petroleum resources of the United States: Economic Geology 10, p. 695-712, 1915; Smithsonian Inst., Ann. Rpt. 1916, p. 273-287, 1917. The Appalachian field, which includes Pennsylvania is considered. Reserves are computed. Mostly production figures are discussed.

ARTHUR, EDMUND WATTS

1. Some high-lights of the geology of western Pennsylvania as affecting the faunal life of the region: Ruffed Grouse 1, p. 6-9, 1944. A popular account of the physiography of western Pennsylvania is given.

ASHBURNER, CHARLES ALBERT, 1854-1889. See also Carll, John Franklin, 7; Hill, Frank A., 2; Platt, Franklin, 16; White, Israel Charles, 15.

1. Discovery of Vespertine coal beds in Huntingdon County, Pennsylvania: Engineering and Mining Jour. 20, p. 548-549, 1875. A very detailed section of over 2000 feet is given to show coal beds in the [Mauch Chunk] Formation in Sideling Hill.
2. First report of progress in the anthracite coal region—the geology of the Panther Creek Basin or eastern end of the Southern field [Schuylkill-Carbon Counties]: Pa. Geol. Survey 2nd, AA, 407 p., atlas, 1876. A complete description of the geology and coal resources is given. Sections are measured; analyses are made, and structure is discussed. The Mammoth bed is the most important.
3. Section of the Paleozoic strata of Huntingdon County, Pennsylvania: Engineering and Mining Jour. 22, p. 105, 1876. The section from the Ordovician to the [Pennsylvanian] is listed in detail.
4. A measured section of the Paleozoic rocks of central Pennsylvania [Huntingdon County], from the top of the Allegheny River coal series, down to the Trenton limestone in the lower, or Cambro-Silurian system: Amer. Phil. Soc., Proc. 16, p. 519-560, 1877. Over eighteen thousand feet of composite section is listed and described in detail. The fossils are listed.
5. Description of the Wilcox [McKean County] spouting water-well: Amer. Phil. Soc., Proc. 17, p. 127-133, 1877; discussion, 133-135; Amer. Jour. Sci. 3rd ser. 16, p. 144-147, 1878. Every seven minutes, water and gas are ejected from 85 to 115 feet. Water filling a gas well creates pressure which is regularly relieved by spouting.
6. Report of the Aughwick Valley and East Broad Top district [Huntingdon County]: Pa. Geol. Survey 2nd, F, p. 141-228, illus., 1878. A complete geologic report of the area is given. Ordovician-[Pennsylvanian] rocks are exposed. The structure is primarily folds; sections are measured. Iron ore is present in the Silurian rocks.
7. The oil sands of [Western] Pennsylvania: Franklin Inst., Jour. 105 [3rd ser. 75], p. 225-233, illus., 1878. A general discussion of the Devonian-[Pennsylvanian] rocks of the region is given. Production is from Pennsylvanian rocks in the southwest and from Devonian rocks in the northwest. It is also from the [Mississippian]. Each sandy section is discussed. No structural interpretation is made. Tables of statistic are included.
8. Oil well records in McKean and Elk Counties, Pennsylvania: Amer. Phil. Soc., Proc. 18, p. 9-26, 1879. Eight detailed well logs are presented; they are in [Mississippian] and Devonian rocks. No synthesis is given, however.
9. The Bradford oil district of [McKean County] Pennsylvania: Amer. Inst. Mining Engineers, Trans. 7, p. 316-328, 1879. The subsurface Devonian stratigraphy is described. The Bradford sand's stratigraphic position is discussed.
10. The Kane geyser well [McKean County]: Franklin Inst., Jour. 108 [3rd ser. 78], p. 347-348, 1879; Amer. Jour. Sci. 3rd ser. 18, p. 394-395, 1879. An oil well encountered fresh water and gas. When the water column is overcome by the gas pressure, it is blown out at intervals, creating a form of geyser.
11. Notes of a reconnaissance across the hills from Roulet to Sharon [Potter County] and back . . . to compare the conglomerates covering the hilltops in Potter and McKean [Counties]: Pa. Geol. Survey 2nd, GGG, p. 97-105, illus., 1880. Several different conglomerates are evident from many measured

sections. The section is, from top to bottom: Olean cg. (Pottsville); shale [Mauch Chunk]; sandstone (upper Pocono); sub-Olean cg. (middle Pocono); shale and sandstone (lower Pocono); red shale [Catskill]; shale [Chemung].

12. On the constitution of the Bradford oil sand [McKean County]: Amer. Phil. Soc., Proc. 18, p. 419-422, 1880. The Bradford sand is fine but porous, constant in thickness, and homogenous in section. It is very widespread. It was probably deposited by a slow, constant current. It is not a shore deposit, but probably is an old bay or estuary. The Venango sands are compared and are shown to be very different.
13. Renovo coal basin [Clinton County]: Pa. Geol. Survey 2nd, G4, p. 73-78, illus., 1880. Five coals of Lower [Pennsylvanian] age are present and are described in detail.
14. The geology of McKean County, and its connection with that of Cameron, Elk, and Forest [Counties]: Pa. Geol. Survey 2nd, R. xii, 371 p., atlas, 1880; discussion with title, Drilling for coal in Sergeant Township, McKean County, by N. F. Jones: Appendix A to [Bull.] R, p. 1-13, 1881; reply by J. P. Lesley, p. 14-20; reply by author, p. 21-35; also RR, p. 327-362, 1885. A complete geologic description of the area is given. Devonian-[Pennsylvanian] rocks are exposed. The structure and coal basins is discussed. Sections are measured; fossils are listed, and correlations are made. Petroleum, coal, natural gas, stone, and clay are the chief resources. Paint ore is a minor product.
15. The oil sands of Pennsylvania: Engineers Club of Philadelphia, Proc. 1, p. 3-11, illus., 1880. A generalized description of Devonian-Permian rocks is given which includes special emphasis on the oil-bearing sands.
16. Geological section at St. Mary's, Elk County, Pa.: Amer. Phil. Soc., Proc. 19, p. 337-348, illus., 1881. A section from the Allegheny Formation down to the Pocono Formation is measured and described. The Catskill and Chemung rocks are described from a well nearby. Analyses of the coals are given.
17. Map of part of the Mahony and Shenandoah basins in the second anthracite coal field, *in* A special report to the legislature . . . by Franklin Platt: Pa. Geol. Survey 2nd, A2 (in pocket), scale, 1 inch equals 800 feet; Amer. Inst. Mining Engineers, Trans. 9, pl. 1, 1881. In a report dealing with coal technology is a map of the distribution of certain anthracite beds.
18. (and others). Atlas of anthracite fields—Northern anthracite field, pts. 1-6; Eastern middle anthracite field, pts. 1-3; Western middle anthracite field, pts. 1-3; Southern anthracite field, pts. 1-4, 4B, 5, 6: Pa. Geol. Survey 2nd, AA, 1883-91. Nineteen atlases of maps, cross sections, and columnar sections are given with small amount of text on sheets. Maps have scale 1 inch equals 9600 feet. Only [Pennsylvanian] rocks are considered.
19. The anthracite coal beds of Pennsylvania: Amer. Inst. Mining Engineers, Trans. 11, p. 136-159, 1883. A series of measured sections are given. The attempt to recognize and correlate coal beds is discussed.
20. Brief description of the anthracite coal fields of [northeastern] Pennsylvania: Engineers Club of Philadelphia, Proc. 4, p. 177-208, illus. incl. geol. map, 1884. A generalized description of the fields is given. Geography, history, topography, structure, and statistics are discussed. Generalized sections are given. The rocks involved are entirely [Pennsylvanian], although the entire Paleozoic section is mentioned.
21. The anthracite coal fields of Pennsylvania: Scientific American, Supplement 18, p. 7410-7413, illus., 1884. A complete but general description of the region is given. Cambrian-[Pennsylvanian] rocks are listed. Cross sections are included, as are production figures and analyses.
22. Pennsylvania anthracite: Science 3, p. 310-312, 1884. This is a discussion of the classification of anthracite and some of the problems inherent in it. A generalized classification is given. He recommends changes.
23. [The co-mingling of Catskill and Chemung faunas, Western Pa.] [abs.]: Science 4, p. 327, 1884; discussion by J. Hall, p. 327.
24. Sketch of the geology of Carbon County, *in* History of the counties of Lehigh and Carbon in the Commonwealth of Pennsylvania, by A. Mathews and A. N. Hungerford: p. 650-656, illus., Philadelphia, 1884. A generalized description of the geology of the county is discussed. Formations IV [Oneida] to XIII [Allegheny] are present. The anthracite is described. A section is measured.

25. Anthracite coal fields—Western, Middle, and Southern fields . . .: Pa. Geol. Survey 2nd, Grand Atlas, Div. 2, pt. 1, 1884; Northern and Eastern Middle fields . . .: Pa. Geol. Survey 2nd, Grand Atlas, Div. 2, pt. 2, 1885. Maps and columnar sections relating to the anthracite fields are given. The atlas contains reproduced charts and maps from Bull. AA of the same author.

26. General map of the anthracite coal fields, *in* Second report of progress on the anthracite coal field, part 1: Scale 1 inch equals 5 miles, 1885. In a report on statistics is a map showing the location of the anthracite coal basins in the Commonwealth.

27. Note on iron ore in Cameron County: Pa. Geol. Survey 2nd, RR, p. 363-368, 1885. All of the possible ore-bearing strata are considered. An ore bed occurs at the top of the Mauch Chunk Formation, and is overlain by various members of the Pottsville Formation. It is mostly leached iron carbonate nodules, but is not economical unless mixed with higher grade ore which is not available. No analyses are made.

28. The township geology of Elk County: Pa. Geol. Survey 2nd, RR, pt. 2, p. 61-299, illus. incl. atlas, 1885. This is a complete geologic description of the area. Devonian-[Pennsylvanian] rocks are present. Some nearby areas are also included in the atlas. Sections are measured. Coal is the chief mineral resource. Natural gas and fire clay are also present.

29. The township geology of Forest County, the geology of the coal measures: Pa. Geol. Survey 2nd, RR, pt. 2. p. 300-325, illus. incl. atlas, 1885. Detailed sections of the Pottsville Formation are presented, as most of the county is underlain by this unit. A few uneconomic coals are present.

30. Borings for oil in Jackson and Abbott townships, Potter County: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 82-94, illus., 1886. The possibilities of oil in Potter County are considered. Several wells are logged and data are interpreted. [Mississippian] and Devonian rocks are present.

31. Description of the Archbald potholes [Lackawanna County]—also of the buried valley of New Port Creek near Nanticoke [Luzerne County]: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 615-636, illus, 1886. Sixty-foot-deep potholes in a now-small creek were formed during glacial time by meltwater flowing off the front of a glacier or by subglacial streams. A whirlpool-deepening of the buried Newport Creek valley created a cave-in when encountered by coal mines. The course of the pre-glacial stream is charted.

32. Report on the Bernice coal basin in the Loyalsock and Mehoopany coal field, in Sullivan County: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 459-490, illus. incl. geol. map, 1886. The Bernice area is the largest single coal field in this small cluster. It is described in detail. Sections are measured and analyses are made. [Pennsylvanian] rocks only are present.

33. Report on the Brandywine Summit kaolin bed, Delaware County: Pa. Geol. Survey 2nd. Ann. Rpt. 1885, p. 593-614, illus., 1886. The kaolin bed was formed *in situ* by the weathering of a feldspar bed which is interstratified with mica schist, slate, and sandstone of [Precambrian] age. A section is measured.

34. Report on the Tipton Run coal openings, Blair County: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 250-268, illus.. 1886. Coal occurrences in the Pocono Formation are discussed. Locally they are economical, as at Tipton Run. Sections are measured; analyses are made.

35. Report on the Wyoming Valley [Luzerne County] limestone beds, accompanied by a description of the fossils contained in the same, by Angelo Heilprin: Wyoming Hist. Geol. Soc., Proc. 2, p. 254-264, illus., 1886; Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 437-450, illus., 1886. Four limestones are described from outcrop and from coal-shaft sections. They are interbedded in the Pottsville and Allegheny Formations. They are, from bottom to top: Hillman, unnamed, Canal. and Mill Creek (fossiliferous). A section is measured, and fossils are illustrated.

36. Second report of progress in the anthracite coal regions—Part 2: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 269-436, illus. incl. geol. map, 1886; in part, with title, The classification and composition of Pennsylvania anthracites: Amer. Inst. Mining Engineers, Trans. 14, p. 706-726, 1886; Engineering and Mining Jour. 41, p. 150-151, 1886. A complete geological description of the anthracite regions is given. Structure and stratigraphy are discussed; correla-

tions are made between the four fields. Sections are measured. Classification and composition of the anthracite are given. This report supplements the anthracite field atlases. Structure of the northern field is discussed in detail.

37. The geology of natural gas: Amer. Inst. Mining Engineers, Trans. 14, p. 428-438, 1886; *in* A practical treatise on petroleum, by B. J. Crew: p. 470-478, Baird and Co., Philadelphia, 1887. The occurrence of gas depends on (1) porosity of reservoir, (2) fracturing of beds adjacent to reservoir, (3) structure of gas sand, (4) proportion of oil, gas and water, and (5) pressure. Examples from western Pennsylvania are used.
38. The product and exhaustion of the oil regions of Pennsylvania and New York: Amer. Inst. Mining Engineers, Trans. 14, p. 419-428, illus., 1886; *in* A practical treatise on petroleum, by B. J. Crew: p. 457-470, illus., Baird and Co., Philadelphia, 1887. A very brief resumé of the producing areas of the Commonwealth is given. Much emphasis is placed on production figures.
39. The geologic distribution of natural gas in the United States: Amer. Inst. Mining Engineers, Trans. 15, p. 505-542, illus. incl. geol. map, 1887; Engineering and Mining Jour. 43, p. 38-39, 58-60, 76-77, 1887. A complete, general review of the subject is given, with examples drawn from the Commonwealth as well as is a review of the occurrences in the Commonwealth.
40. The geologic relations of the Nanticoke [Luzerne County] disaster: Amer. Inst. Mining Engineers, Trans. 15, p. 629-644, illus., 1887. Coal miners cut into a gravel-filled pothole in a buried valley with great disaster. The pothole is described and explained. It occurred as a result of falling water from a glacier which scoured it out as a whirlpool.

ASHLEY, GEORGE HALL. See also Cleaves, Arthur Bailey, 8; Johnson, Roswell Hill, 1; Knopf, Eleanora Frances Bliss, 2; Lovejoy, Ellis, 1; Miller, Benjamin LeRoy, 25; Peck, Frederick Burritt, 6; Renick, B. Coleman, 1; Stone, Ralph Walter, 56; Stose, George Willis, 32; Swartz, Charles Kephart, 3; White, Israel Charles, 29.

1. Cannel coal in the United States: Mining World 23, p. 90-92, 381-383, illus., 1905. Analyses, physical properties, extent, thickness, and mining methods of cannel coal are given. It occurs in Clearfield, Armstrong, and Beaver Counties in the Commonwealth.
2. An area of faulting in central Pennsylvania [abs.]: Science ns 23, p. 33, 1906.
3. Clearfield coal field [Clearfield County] Pennsylvania: U. S. Geol. Survey, Bull. 285, p. 271-275, illus., 1906. The structure and resources of this field are discussed. No stratigraphy is mentioned.
4. Notes on clays and shales in central Pennsylvania: U. S. Geol. Survey, Bull. 285, p. 442-444, 1906. Flint clay, plastic clay, and shale are found in several locations from Clearfield, Indiana, and Jefferson Counties.
5. The maximum deposition of coal in the Appalachian coal field: Economic Geology 1, p. 788-793, 1906. The Appalachian basin is used as an example. Considering all of the coal beds together, over 250 feet have been deposited, with 300 feet being the maximum.
6. The maximum rate of deposition of [Pennsylvania] coals: Economic Geology 2, p. 34-47, illus., 1907. Considering all implications, the minimum time required to deposit one foot of coal is 300 years. In Pennsylvania, with about 300 feet of coal, about 90,000 years were required to deposit the coal. This is a minimum figure.
7. Were the Appalachian and Eastern Interior coal fields ever connected?: Economic Geology 2, p. 659-666, 1907. The lower Pottsville Formation is absent in Illinois. The middle Pottsville Formation is present in both. No post-Sharon conglomerate is in Illinois. Post-Pottsville rocks in both areas have little in common.
8. Studies in mechanics of Allegheny structure [abs.]: Science ns 27, p. 924-925, 1908.
9. Stratigraphic study of the Appalachian and Central states with reference to the occurrence of oil and gas [abs.]: Geol. Soc. Amer., Bull. 23, p. 725-726, 1912; Science ns 35, p. 312, 1912.
10. (and Campbell, Marius Robinson). Geologic structure of the Punxsutawney, Curwensville, Houtzdale, Barnesboro, and Patton quadrangles, [Cambria, Indiana, Clearfield, Centre Counties] central Pennsylvania: U. S. Geol. Sur-

vey, Bull. 531, p. 69-89, illus., 1913. A structure contour map on the Lower Freeport coal and borings of various kinds outline the structure. A series of gentle folds and normal faults are outlined.

11. Oil resources of black shales of the eastern United States: U. S. Geol. Survey, Bull. 641, p. 311-324, 1917. The Commonwealth is included as part of a regional discussion. Analyses for oil content are given for several samples of cannel coal and black shale associated with the bituminous coal fields.
12. Cannel coal in the United States: U. S. Geol. Survey, Bull. 659, 127 p., illus., 1918. Cannel coal occurs in Beaver County, Armstrong County and several others. Various occurrences are described. The origin is briefly discussed also. Analyses are made.
13. Development and probable life of gas pool at McKeesport, [Allegheny County] Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 3, 3 p. (#), 1919. Gas wells in the Speechley [Devonian] sand outline the Murrysville or Roaring Run anticline.
14. Oil and gas in southeast Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 2, 4 p. (#), 1919. A generalized description of the rocks of this part of the Commonwealth and explanations as to why there is no petroleum to be found are given.
15. Sulphur in coal, geological aspects: Amer. Inst. Mining and Metallurgical Engineers, Bull. 153, p. 2073-2079, 1919; Trans. 63, p. 732-738, 1920; discussions by R. D. Hall and E. N. Zern: Mining and Metallurgy 157, sec. 12, p. 60, 1920. This is a general discussion of the origin of pyrite in coal and the various physical ways in which it appears. Examples are drawn from the Commonwealth.
16. A high-grade building stone in Greene County: Pa. Topog. Geol. Survey [4th ser.], Bull. 7, [2 p.] (#), 1920. A sandstone resembling Bedford limestone is described, but no location or names are given. A good future is predicted.
17. Future of natural gas in Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 17, 4 p. (#), 1920. A number of suggestions are made for more economical use and production of gas, one of which is deeper drilling. More exploration is needed. The Portage shales are suggested as a source.
18. Future sources of power: Pa. Topog. Geol. Survey [4th ser.], Bull. 14, 3 p. (#), 1920. Coal, oil, gas, solar energy, and atomic power are considered. Coal reserves are described.
19. Geology of oil and gas in relation to coal: Pa. Topog. Geol. Survey [4th ser.], Bull. 16, 6 p. (#), 1920. The physical and chemical relationships of oil, gas, and coal are considered in connection with origin and migration and storage. References are made to locations in the Commonwealth.
20. How the "Grand Push" determined present character of Pennsylvania coal: Coal Age 17, p. 1307-1310, illus., 1920; revised with title, The origin of Pennsylvania coal: Pa. Topog. Geol. Survey [4th ser.], Bull. 8, 7 p. (#), 1920. This is a generalized discussion of the geologic history of the Commonwealth and its relation to the coal-forming processes. Analyses of coals are given.
21. The McKeesport gas pool, Allegheny County, Pa.: Pa. Topog. Geol. Survey [4th ser.], Bull. 5, 26 p. (#), illus., 1920; revised ed., 18 p. (#), illus., 1920 [1922]. The Upper Devonian Speechley sand is extensively drilled on the Murrysville anticline. Other sands also produce. No details are given.
22. The possibility of oil and gas from deeper drilling in western Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 10, 5 p. (#), 1920. The Speechley sand of Upper Devonian age, the Oriskany sand of Middle Devonian age, and the Medina sand of Silurian age are considered. All are present and are potential reservoirs where structures permit.
23. The story of the Pennsylvania survey: Pa. Topog. Geol. Survey [4th ser.], Misc. Papers 1, 20 p., illus., 1920. A brief history of the development of the survey, from its inception in 1836 to the present is given. The plans for the present survey are presented. This is essentially the first annual report.
24. Feldspar in Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 21, 2 p. (#), 1921. This is a very generalized description of the source of feldspar. All come from pegmatite in the southeastern part of the Commonwealth. Chester and Delaware Counties are the big producers.

25. Mineral resources of Pennsylvania: Engineers Soc. Western Pa., Proc. 37, p. 1-20, 1921; revised ed., Pa. Topog. Geol. Survey [4th ser.], Bull. 15, 12 p. (#), 1920. This is a very generalized review of the mineral resources of the Commonwealth. Coal is the most valauble of all. It is presented in a popular manner, with no geologic detail being given.

26. (and Fettke, Charles Reinhard). Pennsylvania coals and shales greatly vary in their content of oil: Coal Age 19, p. 401-403, 1921. This is primarily a table showing coal and oil shale analyses, which includes a description of the residue. In general, the Commonwealth does not contain much oil-bearing coal and shale. None comes from anthracite or the shales of the eastern area. Bituminous and cannel coal from the western counties contain the most, though still not much.

27. The outlook for oil and gas in Pennsylvania: Amer. Assoc. Petroleum Geologists, Bull. 5, p. 357-372, 1921. The future supplies from various areas in the Commonwealth are discussed. Production figures are given. New areas are outlined, old areas can be rejuvenated. He predicts a decline in 20-30 years to a vanishing point in 100 years for petroleum. Gas is similarly discussed, and is destined to run out in 100 years. The Medina and Oriskany Formations have yet to be tested for oil and gas.

28. Proposed new nomenclature of the Appalachian coal measures [abs.]: Geol. Soc. Amer., Bull. 33, p. 111, 1922; discussion by I. C. White, C. D. White, and D. F. Higgins, p. 111-112; reply by author, p. 112.

29. (and Robinson, J. French). The oil and gas fields of Pennsylvania, vol. 1, Introduction: 79 p., illus., Pa. Geol. Survey 4th, 1922. A generalized summary of the fields in the Commonwealth is given. The major sands are described, as are the major controlling structures. Production by counties is described.

30. The fire brick materials of Pennsylvania: Amer. Ceramic Soc., Jour. 6, p. 837-849, 1923. A general discussion of the characteristics, distribution, and reserves of clay, flint clay, and ganister in the Commonwealth is given.

31. The work of the Pennsylvania Geological Survey, 1919-1922: iv, 18 p., illus., Pa. Topog. Geol. Survey [4th], 1923. This is a progress report of the accomplishments of the Survey to date. The organization of the Survey is shown.

32. Silurian stratigraphy at Lehigh Gap [Carbon-Lehigh Counties]: Pa. Topog. Geol. Survey [4th ser.], Bull. 88, 6 p. (#), 1925. A detailed section is measured. It is suggested that the more than 1200 feet of rock is the Tuscarora Formation which has been thickened by faulting rather than being due to the presence of the Clinton and Medina (Oswego-Tuscarora) Formations.

33. Geology and mineral resources of the Punxsutawney quadrangle, [Clearfield, Jefferson, and Indiana Counties] Pennsylvania: Pa. Geol. Survey [4th], Topog. Geol. Atlas 65, 145 p., illus. incl. geol. map, 1926. A complete geologic description of the area is given. Only Pennsylvanian rocks are present. Coal, clay, limestone, sandstone, iron, and oil and gas are the mineral resources. Sections are measured, and analyses are made.

34. Memorial of Richard R. Hice [1865-1925]: Geol. Soc. Amer., Bull. 37, p. 94-96, port., 1926.

35. Pennsylvania, the makings of a world power: Pa. Topog. Geol. Survey [4th ser.], Bull. 90, 23 p. (#), 2nd ed., 1926. This is a generalized, popular review of the mineral wealth of the Commonwealth. No geologic details are given.

36. A stratigraphic time scale: Pa. Topog. Geol. Survey [4th ser.], Bull. 91, 10 p. (#), 1927. A proposal for terms for time-units and time-rock units to be used in the Commonwealth is given. Examples are given in the Conemaugh Formation and the Upper Devonian of Pennsylvania.

37. Glacial studies of Frank Leverett outside of the Lewis and Wright glacial boundary in Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 38, p. 210-211, 1927; Pan-Amer. Geologist 47, p. 313-314, 1927.

38. General information on coal—Part 1 *of* Bituminous coal fields of Pennsylvania, Introductory volume: Pa. Geol. Survey 4th ser., M6, 241 p., illus., 1928. This is a complete discussion of the terminology used involving Pennsylvania coals and their classification. Also included is a general discussion of the bituminous deposits of the Commonwealth. The stratigraphy of the coal measures is presented as Pennsylvanian-Permian. Much correlation is made.

39. Mineral resources of Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 97, 9 p. (#), 1928. This is a generalized, popular account of the many mineral resources of the Commonwealth. No geographical details are given.

40. Mineral resources of the lower Allegheny-Beaver River district: Pa. Topog. Geol. Survey [4th ser.], Bull. 95, 6 p. (#), 1928. This area includes Beaver, Lawrence, Butler, Clarion, Armstrong, northern Allegheny, and Westmoreland Counties. A listing of the mineral resources, and a very generalized statement about their distribution is made. The minerals are: bituminous coal, oil and gas, oil shale, clay, shale, sand and gravel, sandstone, limestone, cement, iron ore, pyrite, and salt.

41. The Canadian System: Pa. Topog. Geol. Survey [4th ser.], Bull. 93, 10 p. (#), 1928; Prog. Rpt. 119, 7 p. (#), 1938. The use of the stratigraphic term Canadian System is advocated and reasons are given to support it. It includes the Beekmantown and Chazyan rocks in the Commonwealth. It overlies the Cambrian System and underlies the Silurian System. Its correlation with other Appalachian states is given.

42. Age of the Appalachian peneplains: Geol. Soc. Amer., Bull. 41, p. 695-700, 1930. The peneplain in Pennsylvania is calculated to be about 8 million years old, based on evidence of rate of erosion in all parts of the Commonwealth. Since Tertiary time started about 60 million years ago, the peneplain must be Miocene at the oldest.

43. The Monongahela series of Pennsylvania: W. Va. Acad. Sci., Proc. 3, 1929, p. 147-158, illus., [1930]; W. Va. Univ. Bull., ser. 30, no. 1, [1930]. A complete description of the unit is given. Sections are measured. It contains more limestone than do the other formations and it contains the Pittsburgh and other coals. Each member is described individually.

44. A syllabus of Pennsylvania geology and mineral resources: Pa. Geol. Survey 4th ser., G1, 160 p., illus. incl. geol. map, 1931. This is a popular description of the geology and mineral resources of the Commonwealth. The general stratigraphy, structure, and mineral resources are considered.

45. Our youthful scenery: Geol. Soc. Amer., Bull. 42, p. 537-545, 1931. Many areas, including the Commonwealth are described and the physiography outlined. He maintains from observations that (1) all present-day features were formed post-Miocene, and that (2) few land surfaces, if any, have any relation to pre-Miocene surfaces. The ages of the peneplains are considered.

46. Pennsylvanian cycles in Pennsylvania: Ill. State Geol. Survey, Bull. 60, p. 241-245, 1931. The Commonwealth was characterized by widespread, slow sinking with long pauses and frequent slight uplifts. In general, the sinking was uniform so that similar conditions occurred over a large area. There is, however, no persistent order or succession of the rocks outside of the usual association of argillaceous deposits below, within, and above the coals.

47. Anthracite field—Mauch Chunk [Carbon County] to Lebanon [Lebanon County], *in* Mineral deposits of New Jersey and eastern Pennsylvania, by C. P. Berkey: Internat. Geol. Cong., 16th, U. S. 1933, Guidebook 8, Excursion A-8, p. 44-48, illus., 1932. A general description of the structure of the anthracite folds, with the major geologic features along the route, is given.

48. Clearfield County, *in* Detailed descriptions of coal fields—Part 4 *of* Bituminous coal fields of Pennsylvania: Pa. Geol. Survey 4th ser., M6, p. 153-187, illus., 1926; 2nd ed., 1932. A complete description of the area with emphasis on the coal formations is given. Only Pennsylvanian rocks are described. Sections are measured; correlations are made. Fifteen coal beds are present, but only four are important.

49. (and Cathcart, Stanley Holman). Gas in the Tioga [Tioga County] region, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 102-A, 13 p. (#), illus., 1932. Devonian-Pennsylvanian surface rocks are described, and Silurian-Devonian formations are described from well logs. The structure (anticlines) is described. The production is from the Oriskany sandstone. A portion of Potter County is included in the discussion.

50. Physiographic studies in Pennsylvania [abs.]: Pa. Acad. Sci., Proc. 6, p. 91-94, 1932. The general physiography of the Commonwealth is discussed with special emphasis on the various peneplains which have been proposed and proved.

51. (and Sisler, James Donaldson). Stratigraphy of the oil and gas fields of Pennsylvania, *in* Contributions to oil and gas geology of western Pennsylvania: Pa. Geol. Survey 4th ser., M19, p. 5-15, illus., 1933. The section between the Medina sandstone and the Pittsburgh coal is described from well logs. Production comes from all of the systems present. Correlations are shown.
52. The scenery of Pennsylvania, its origin and development, based on recent studies of physiographic and glacial geology: Pa. Geol. Survey 4th ser., G 6, xi, 91 p., illus., 1933. A semi-popular account of the origin of many of the physiographic features in the Commonwealth is given. Glacial features are discussed in detail.
53. The undeveloped mineral resources of Pennsylvania, Introduction: Pa. Geol. Survey 4th ser., M-18 A, 16 p., 1933. A brief, generalized discussion of the mineral resources of the Commonwealth is given. A list of the various types is included.
54. [Geology of] Third Mountain [Dauphin County]: Trip 2 *of,* Field Conf. of Pa. Geologists, 3rd, 5 p. (#), Harrisburg, 1933. A road log from Harrisburg to the tip of Third Mountain, with no details, is given.
55. Memorial of Edward Vincent D'Invilliers [1857-1928]: Geol. Soc. Amer., Proc. 1934, p. 221-224, port., 1935.
56. Studies in Appalachian mountain sculpture: Geol. Soc. Amer., Bull. 46, p. 1395-1436, illus., 1935; discussion by G. H. Chadwick, p. 2055-2056; reply by author, p. 2056-2057; abstract with discussion, Geol. Soc. Amer., Proc. 1933, p. 61-62, 1934; discussion with title, A study in Appalachian physiography, by K. Ver Steeg: Jour. Geology 50, p. 504-511, 1942. The lowering of the surface of the Commonwealth has been about 100 feet/million years for hard rocks, and several hundred feet/year for softer rocks. The level surfaces in the Commonwealth are accounted for by base levelling, stripping of horizontal hard rocks, and parallel lowering due to uniformity of rock and structure. Post-peneplain trenching can be shown by capture and under-cutting not necessarily associated with coastal movements. Most physiographic features are very young.
57. (and Willard, Bradford). The use of the term Pocono: Science ns 81, p. 615-617, 1935. An historical account of the term "Pocono." The Pocono plateau, unfortunately, is not underlain by this formation. The Pocono was once considered to be a Devonian term, including what is now the Catskill Formation.
58. Unsolved problems in Coal-measures stratigraphy [abs.]: Geol. Soc. Amer., Proc. 1934, p. 64-65, 1935; discussion by W. H. Collins, p. 65.
59. Memorial of James Donaldson Sisler [1896-1935]: Geol. Soc. Amer., Proc. 1935, p. 319-322, port., 1936.
60. Memorial of Baird Halberstadt [1860-1934]: Geol. Soc. Amer., Proc. 1936, p. 159-162, port., 1937.
61. Anthracite reserves and geology: Annual Anthracite Conf. of Lehigh Univ., 1st, April, 1938, Trans. [1], p. 11-24, illus., 1938. There are 150 years of reserve left. A general geologic description of the anthracite fields, including stratigraphy, structure, and conditions of origin, is given. Isovol maps are used to show the relations of the anthracite area to the bituminous area.
62. History of development and geologic relationships of Appalachian [oil and gas] fields: Amer. Assoc. Petroleum Geologists, Bull. 22, p. 416-430, illus., 1938. The limiting factors of the various fields in the Commonwealth are discussed. To the west, the factors are: (1) thinning of reservoirs, and (2) facies changes of reservoirs. On the east, the main factors are: (1) continental facies of most formations, and (2) distillation by orogeny. Sections are used as illustrations.
63. The age of the drift sheets of Pennsylvania [abs.]: Pa. Acad. Sci., Proc. 12, p. 88, 1938.
64. How old are the mountains?: Pa. Dept. Internal Affairs, Monthly Bull. 7, no. 10, p. 11-16, 1939. A popular, generalized discussion of the development of the physiography of the Commonwealth is given.
65. How our Pennsylvania got this way: Pa. Dept. Internal Affairs, Monthly Bull. 7, no. 9, p. 8-13, 1939. A generalized, popular account of the geologic history of the Commonwealth is given.

66. Mountains of Pennsylvania and their origin, — [Part 1]: Pa. Dept. Internal Affairs, Monthly Bull. 8, no. 1, p. 8-13, illus., 1939; — Part 2, with title, Old mountain theories are challenged by findings, no. 2, p. 15-21, illus., 1940. This is a popular, generalized discussion of the earlier ideas of the physiography of the Commonwealth compared with the latest ones.
67. The coal fields of Pennsylvania, *in* Analyses of Pennsylvania bituminous coals: U. S. Bur. Mines, Tech. Paper 590, p. 1-11, illus., 1939. A generalized resumé of the fields is given. It includes a brief discussion of surface features, district-division, stratigraphy, and reserves.
68. (and Clapp, Frederick Gardner). Geology and mineral resources of Curwensville quadrangle [Clearfield County]: Pa. Geol. Survey 4th ser., Topog. Geol. Atlas 75, v, 140 p., illus. incl. geol. map, 1940; summary, Pa. Dept. Internal Affairs, Monthly Bull. 9, no. 2, p. 24-27, 1941. A complete geologic report of the area is given. Mississippian-Pennsylvanian rocks are at the surface. Analyses are made. Coal is the major resource. Clay, shale, sandstone, and limestone are minor resources.
69. Memorial to James Rieman Macfarlane [1850-1938]: Geol. Soc. Amer., Proc. 1939, p. 211-212, port., 1940.
70. (and others). [Geology of the Johnstown area, Cambria, Somerset, and Westmoreland Counties]: Field Conf. of Pa. Geologists, 11th, [5 p.] (#), illus., Johnstown, 1941. This is a mimeographed set of road logs and itineraries visiting various outcrops of Devonian-Pennsylvanian rocks. No details are given.
71. Memorial to Marius Robinson Campbell [1858-1940]: Geol. Soc. Amer., Proc. 1940, p. 171-183, port., 1941.
72. Pennsylvania and nature's blitzkrieg: Pa. Dept. Internal Affairs, Monthly Bull. 9, no. 7. p. 7-10, illus., 1941. In a generalized and popular manner, the resistance of the Pocono area to deformation is accounted for by the presence of massive sandstone formations.
73. Pennsylvania's geological survey, its history: Pa. Dept. Internal Affairs. Monthly Bull. 10, no. 2, p. 21-26, 1942. A popular, generalized discussion of the history of the four Surveys is given.
74. The Appalachian dent in Pennsylvania: Pa. Dept. Internal Affairs, Monthly Bull. 10, no. 9, p. 13-14, 25, 1942. A popular account of the pattern of the folded mountains in the Commonwealth is given. The change in direction at Harrisburg is discussed.
75. Eagles Mere [Sullivan County] is interesting geologic center: Pa. Dept. Internal Affairs, Monthly Bull. 12, no. 1, p. 9-11, 1943. This lake is formed by a glacial dam in a valley high in the folded mountains. A popular account explains how it came about.
76. (and others). Mineral resources, Part 2 *of* Pennsylvania's mineral heritage: p. 73-248, illus., Pa. Dept. Internal Affairs. 1944; correction with title, Anthracite reserves revised by fields and counties: Pa. Dept. Internal Affairs, Monthly Bull. 14. no. 1, p. 29-30, 1945. This is a semi-popular account of the mineral resources of the Commonwealth, their occurrence, and reserves. Each county is described individually for the resources which it has.
77. Anthracite reserves: Pa. Topog. Geol. Survey [4th ser.], Prog. Rpt. 130, 13 p., illus., 1945. The total reserves are 8,979 million tons. Each district is considered separately.
78. (and Graham, Jack Bennett). Ground water investigations in Pennsylvania: Pa. Dept. Internal Affairs, Monthly Bull. 13, no. 2, p. 10-13, 28, 1945; Amer. Water Works Assoc., Jour. 37, p. 161-164, 1945. A popular, very generalized discussion of the sources of water in the Commonwealth is given.
79. Memorial to Benjamin LeRoy Miller [1874-1944]: Geol. Soc. Amer., Proc. 1944, p. 277-285, port., 1945.
80. Miller, Benjamin LeRoy [1874-1944]: Mineracão e Metalurgia 10, no. 55, p. 43-47, port.. Rio de Janeiro, 1945.
81. Possible extension of the Levis trough into [eastern] Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 56, p. 1145, 1945.
82. The dinosaur, he sought security, found death [York County]: Pa. Dept. Internal Affairs, Monthly Bull. 13, no. 5, p. 14-18, illus., 1945. A popular account of the dinosaurs in the county as shown by their tracks in the Triassic sandstone is given.

83. The Grand Canyon of [Tioga County] Pennsylvania: Pa. Dept. Internal Affairs, Monthly Bull. 13, no. 7, p. 3-7, 28, illus., 1945. This is a popular account of the formation of the Susquehanna River Canyon. It is caused by superposition of the river by the rejuvenation of the Schooley peneplain.

84. The Pittsburgh-Pottsville boundary: Jour. Geology 53, p. 374-389, illus., 1945. A history of thought on the Pottsville-post-Pottsville Formation boundary is preceded by the suggestion that it be placed at the Lower Kittaning-No. 5 block coal, which is believed to correlate with the Buck Mountain coal at the type section.

ASHMEAD, DEVER C.

1. Anthracite losses and reserves in Pennsylvania: Pa. Geol. Survey 4th ser., [MS], 71 p., illus., 1926. New estimates of reserves, plus better methods of determining losses, result in a reserve of over 16 billion tons. At the 1926 rate of use, this should last 124 years.

ATWOOD, WALLACE WALTER, 1872-1949.

1. The physiographic provinces of North America: xvi, 536 p., illus., Ginn and Co., Boston, [1940]. A comprehensive description of the many physiographic areas of the U. S. includes Pennsylvania. The relation of rock type and structure is considered.

AUSTIN, A. C.

1. Pennsylvania anthracite, a general description: Mines Mag. 24, no. 2, p. 16-19, 27, illus.; no 3, p. 13-15, 27, 1934. A general description of the occurrence and distribution in the Commonwealth, includes mining and production techniques. Sections are given.

AVERITT, PAUL

1. [Map of] Coal fields of the United States, 2 sheets: Scale, 1:2,500,000 (1 inch equals 40 miles), U. S. Geol. Survey, 1942.
2. (and Hanna, Jane and Titcomb, Jane). [Map of] Oil and gas fields of the United States as of March 1, 1946, 2 sheets: Scale, 1:2,500,000 (1 inch equals 40 miles), U. S. Geol. Survey, 1946.

AYERS, VINCENT L.

1. The geologic structure of the lower Nittany valley: M.S. thesis, Penn. State College, 1920.

BACON, LLOYAL ORRIN. See Pirson, Sylvain Joseph, 1.

BAILEY, EDWARD BATTERSBY

1. (and Mackin, Joseph Hoover). Recumbent folding in the [Chester County] Pennsylvania piedmont—preliminary statement: Amer. Jour. Sci. 5th ser. 33, p. 187-190, illus., 1937. The Woodville anticline is described as a recumbent fold, rather than a simple overturned one. This resembles very much the Alpine type of structure.
2. American gleanings, 1936 Pt. 3, Martic overthrust problem in Pennsylvania [abs.]: Geol. Soc. Glasgow, Trans. 20, Part 1 (1937-40), p. 12-13, 1940.

BAILEY, J. TROWBRIDGE

1. The copper deposits of Adams County, Pennsylvania: Engineering and Mining Jour. 35, p. 88-89, 1883; discussion by P. Frazer, p. 112, 1883. The geology of the region is briefly described. Sedimentary rocks overlie volcanic rocks [Precambrian]. Copper-bearing minerals are in an epidotized quartzite; native copper also occurs. He says the copper is associated with the volcanic rocks. Frazer disagrees on most points.

BAIRD, SPENCER FULLERTON, 1823-1887.

1. On the bone caves of Pennsylvania: Amer. Assoc. Adv. Sci., Proc. 2, p. 352-355, 1850. Several caves are described but not located. Most contain Recent bones but some contain fossil forms. Speculation on the source of the bones in the caves is reviewed.
2. Mammals of North America: xxxiv, 764 p., illus., Lippincott, Philadelphia, 1859. A treatise, based on material at the National Museum, includes descriptions of Pleistocene forms from the Commonwealth.

BALTIMORE AND OHIO RAILROAD COMPANY, INDUSTRIAL DEVELOPMENT STAFF.

1. Salt in the area served by the Baltimore and Ohio Railroad: 56 p., illus., [Baltimore], [1949]. The Commonwealth is included. The occurrence of rock salt and brine, mostly from western and northern Pennsylvania is described. Maps show locations and potential areas.

BANNON, BENJAMIN. See Daddow, Samuel Harries, 1.

BARB, CLARK FRED

1. Porosity-permeability relations in Appalachian oil sands: Pa. State College Mineral Industry Experiment Sta., Bull. 9, p. 47-58, illus., 1930; discussion by C. R. Fettke, p. 58-59. Studies on 89 samples from the Bradford area show: (1) rounded grains of a given size will permit more flow than angular grains, (2) rounded grains are uncommon in these sands, and (3) large grains allow greater flow than small grains. Figures are given to show the relationship between porosity and permeability.
2. Oil-field waters of Pennsylvania: Pa. State College Mineral Industry Experiment Sta., Bull. 8, 36 p., illus., 1931. Analyses of ground waters from the western part of the Commonwealth, including techniques, are given. Rates of flow are associated with the chemical composition.

BARBAROSA, ALUIZO L.

1. Geology of Warrior Ridge, Huntingdon County, Pennsylvania: M.S. thesis, Penn. State College, 1947.

BARBOUR, ERWIN HINCKLEY

1. (and Torrey, Joseph, Jr.). Notes on the microscopic structure of oolite, with analyses [Centre County]: Amer. Jour. Sci. 3rd ser. 40, p. 246-249, illus., 1890. An oolite from the [Ordovician] is described. Siliceous oolites are in a siliceous matrix. They are spherical, concentric with alternating light and dark colors, and have been deposited around real or imaginary nuclei. Some nuclei are organic; other are not. The origin may be due to some of the lime bands in those which are alternating lime and silica, being replaced by silica.

BARKER, GEORGE F.

1. Memoir of Frederick Augustus Genth, 1820-1893: Natl. Acad. Sci., Biog. Mem. 4, p. 201-231, port., 1902.

BARLOW, ALFRED ERNEST

1. Memoir of David Pearce Penhallow, 1854-1910: Geol. Soc. Amer., Bull. 22, p. 15-19, port., 1911.

BARNES, HARLEY, JR. See Foose, Richard Martin, 2.

BARNESLEY, EDWARD R. See also Stone, Ralph Walter, 35.

1. A new brachiopod from the Silurian of [Mifflin County] central Pennsylvania: Jour. Paleontology 3, p. 290-291, illus., 1929. *Dalmanella egani*, new, is described from the Keefer sandstone. The associated fauna is listed.

BARRELL, JOSEPH

1. A preliminary survey of the South Mountains, with the valleys adjacent, in the vicinity of Lehigh University [Northampton County] in respect to glaciation: Thesis, 103 p., illus., Lehigh Univ., 1893.
2. The geological history of the Archean Highlands of New Jersey, including their extension in New York and [southeast] Pennsylvania: Thesis, Yale Univ., 1896.
3. Origin and significance of the Mauch Chunk shale: Geol. Soc. Amer., Bull. 18, p. 449-476, illus., 1907. The Mauch Chunk Formation was deposited as a broad flood plain and delta. Both subaqueous and subaerial beds are recognized. Sections are measured. Fossil plants are figured.
4. Criteria for the recognition of ancient delta deposits: Geol. Soc. Amer., Bull. 23, p. 377-446, illus., 1912; discussion by C. D. White, E. T. Wherry, and H. B. Kummel, p. 743-746. This is a paper about deltaic deposits, with examples from the Commonwealth. The Catskill Formation is composed of poorly laminated red shale interbedded with green and gray sandstone. The green and gray beds are tongues of the Chemung Formation, deposited when sedimentation from the delta source temporarily ceased.
5. Post-Jurassic history of the northern Appalachians: Geol. Soc. Amer., Bull. 24, p. 690-694, 1913; discussion by D. W. Johnson, W. M. Davis, and N. H. Darton, p. 694-696. This is an expanded abstract. The Piedmont terraces of the northern Appalachians are shown related to time lines. Pennsylvania is implied but not specifically cited.
6. The Upper Devonian delta of the Appalachian geosyncline: Amer. Jour. Sci. 4th ser. 36, p. 429-472, 1913; 37, p. 87-109, 225-253, illus., 1914. The Catskill-Oneonta-Portage-Chemung Formations are considered as the subaqueous-subaerial portions of a delta. Mud cracks, color, fossils, etc. indicate the

conditions. Examples are given from Pennsylvania. Sections are measured; fossils are listed. The source of the material is discussed.

7. Rhythms and the measurements of geologic time: Geol. Soc. Amer., Bull. 28, p. 745-904, 1917. A general discussion of rhythmic processes, in which reference is made to examples in the Martinsburg and Beekmantown Formations in Lehigh County.
8. (Edited by H. H. Robinson). The Piedmont terraces of the northern Appalachians: Amer. Jour. Sci. 4th ser. 49, p. 227-258, 327-362, 407-428, illus., 1920. The Commonwealth is included. After the Kittatinny peneplain was formed, submergence occurred and Cretaceous seas overlapped it. This is deduced from the drainage patterns. He does not feel that the ridges would have been reduced to level even on the peneplain; hence, superposition would have been impossible unless a thin veneer of Cretaceous sediments were present on which the streams could take their courses. He deduces many erosion levels.

BARROIS, CHARLES

1. [Notice nécrologique sur le geologue Charles Doolittle Walcott, 1850-1927]: Acad. Sci. Paris, C. R. 184, p. 489-493, 1927.

BARTLETT, RALPH L.

1. A study of the peneplains of the southeast Appalachian district, with special reference to the section from Blue Mountain to Quakertown, Pennsylvania: M.S. thesis, Lehigh Univ., 1917.

BARTON, BENJAMIN SMITH

1. [Elephantine bones from near Chambersburg, Franklin County] [abs.]: Phila. Medical and Physical Jour. 2, p. 157, 1805.
2. [Zeolites from near Reading, Berks County] [abs.]: Phila. Medical and Physical Jour. 2, p. 178-179, 1805.
3. Archaeologiae americanae telluris collectanea et specimina: vii, 64 p., Philadelphia, 1814. A series of essays and letters report the presence of mammoth parts from the U. S., including the Commonwealth. One is mentioned in the Susquehanna River, and another along the Ohio River. No details are given.

BASCOM, FLORENCE. See also Campbell, Marius Robinson, 17; Dryden, Abraham Lincoln, 1; Johnson, Douglas Wilson, 5; Knopf, Eleanora Frances Bliss, 2; Stose, George Willis, 27; Watson, Edward Hahn, 1.

1. A contribution to the geology of South Mountain [Adams-Franklin Counties] Pennsylvania: Thesis, Johns Hopkins Univ., 1893.
2. The structures, origin, and nomenclature of the acid volcanic rocks of South Mountain, Pa.: Jour. Geology 1, p. 813-832. 1893. Metamorphic acid volcanic rocks are described in considerable detail. They exhibit flow structures, micropoikilitic structures, spherulites, axiolitic structures, rhyolitic structures, lithophysae, perlitic partings, amygdules, taxitic, and trichitic structures. They are called aporhyolites, inasmuch as the original rock was probably a rhyolite.
3. Perido-steatite and diabase [Delaware County]: Acad. Nat. Sci. Phila., Proc. [48] 1896, p. 219-220, 1896. A serpentine is analyzed as coming from a peridotite; much talc is present; hence, it is a perido-statite. The Conshohocken diabase dike is an ophitic diabase with plagioclase, pyroxene, ilmenite, and apatite as the common minerals.
4. The ancient volcanic rocks of South Mountain [Adams-Franklin Counties], Pennsylvania: U. S. Geol. Survey, Bull. 136, 124 p., illus., 1896. The Lower Cambrian clastics are described, as are acid volcanic flows and basic volcanic rocks. The igneous rocks are Precambrian, the acid flows probably being older. All have been metamorphosed since deposition. Detailed petrographical descriptions are given. They include quartz-porphyry, aporhyolite, acid breccia, sericite schists and slates, melaphyres, augite-porphyrites, basic slates, and pyroclastic rocks.
5. Aporhyolite of South Mountain [Adams-Franklin Counties], Pennsylvania: Geol. Soc. Amer., Bull. 8, p. 393-396, 1897. Bluish-gray aporhyolite studded with spherulites is described. Micropoikilitic structures are also common. The spherulites and other structures are considered to be secondary as are the micropoikilitic structures. Some piedmontite is present.

6. The relation of the streams to the neighborhood of Philadelphia [Philadelphia County] to the Bryn Mawr gravel: Amer. Geologist 9, p. 50-57, illus., 1897. Wissahickon Creek is superimposed on the Bryn Mawr gravel; so are Valley Creek and Gulf Creek which are partly adjusted. A Quaternary age for the gravel seems precluded. It could be Mesozoic.
7. Water resources of the Philadelphia district: U. S. Geol. Survey, Water-Supply Paper 106, 75 p., illus., 1904. A brief description of the rocks in the region is given. Precambrian-Ordovician and Triassic rocks are included. Most of the water of the area comes from surface streams, but the various underground possibilities are also considered.
8. Piedmont district of [southeastern] Pennsylvania: Geol. Soc. Amer., Bull. 16, p. 289-328, illus., 1905. A complete geologic description of the region is given. Precambrian Baltimore gneiss is the basement. It is overlain by Cambrian Chickies quartzite, Cambro-Ordovician Chester Valley limestone, and Ordovician Wissahickon gneiss and schist. A variety of crystalline rocks are also present, which include granite gneiss, gabbro, serpentine, metagabbro, gneiss, and diabase. Analyses are made.
9. (and others). Description of the Philadelphia district [Bucks, Montgomery, Philadelphia, Delaware, Chester Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 162, 23 p., illus. incl. geol. maps, 1909. A complete geologic description of the Norristown, Germantown, Chester, and Philadelphia quadrangles is given. Precambrian-Ordovician, Triassic, and Pleistocene rocks are mapped. Sections are measured. Stone, iron, feldspar, lead, and copper are the minerals discussed.
10. (and others). Description of the Trenton quadrangle, New Jersey [Bucks-Philadelphia Counties] Pennsylvania: U. S. Geol. Survey, Geol. Atlas of U. S. folio 167, 24 p. illus. incl. geol. map, 1909. Precambrian-Cambro-[Ordovician], Triassic, and Tertiary rocks are mapped. The structure is mostly complex folds and faults. Stone, graphite, copper, and barite are the mineral resources discussed.
11. The pre-Cambrian gneisses of the Pennsylvania Piedmont Plateau [abs.]: Science ns 30, p. 415, 1909.
12. Pre-Cambrian igneous rocks of the Pennsylvania Piedmont [abs.]: Geol. Soc. Amer., Bull. 26, p. 81-82, 1915.
13. (and Miller, Benjamin LeRoy). Description of the Elkton and Wilmington quadrangles, Maryland, Delaware, New Jersey, [Chester County], Pennsylvania: U. S. Geol. Survey, Geol. Atlas of U. S. folio 211, 22 p., illus. incl. geol. map, 1920. Precambrian rocks are present in the Chester County portion. Baltimore gneiss, Wissahickon mica gneiss, serpentine, and gabbro are described. The Baltimore gneiss intrudes the Wissahickon gneiss and is intruded by the basic rocks. Diabase and pegmatite intrude all of these. Building stone is the only mineral resource.
14. Cycles of erosion in the Piedmont province of Pennsylvania: Jour. Geology 29, p. 540-559, illus., 1921. Five peneplains are recognized. They are, from oldest to youngest: (1) Kittatinny, (2) Schooley, (3) Honeybrook, (4) Harrisburg, and (5) Early Brandywine. Also recognized and described are four terraces, which are, from oldest to youngest: (1) Late Brandywine, (2) Sunderland, (3) Wicomico, and (4) Talbot. The terraces are Pleistocene; the peneplains are late Cretaceous.
15. The resuscitation of the term Bryn Mawr gravel: U. S. Geol. Survey, Prof. Paper 132-H, p. 117-119, 1924. The old term Bryn Mawr gravel is proposed for the early, high-level gravels of what was once the upper part of the Brandywine Formation. The history of the term is given and reasons for its use are presented. The age is Tertiary.
16. Structural and physiographic features of the Piedmont province of Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 38, p. 211, 1927; Pan-Amer. Geologist 47, p. 319, 1927.
17. (and Wherry, Edgar Theodore, and Stose, George Willis, and Jonas, Anna Isabel). Geology and mineral resources of the Quakertown-Doylestown district [Bucks, Lehigh, Montgomery Counties], Pennsylvania and New Jersey: U. S. Geol. Survey, Bull. 828, 62 p., illus. incl. geol. map, 1931. A complete

geologic description of the quadrangles is given. Precambrian-Ordovician, and Triassic rocks are mapped. The rocks are highly folded and faulted. Sections are measured; fossils are listed. Stone, limestone, sand, gravel, iron ore, paint ore, and copper are the mineral resources.

18. (and Stose, George Willis). Description of the Coatesville and West Chester quadrangles [Lancaster, Chester and Delaware Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 223, 15 p., illus. incl. geol. maps, 1932. A complete geologic description of the area is given. Precambrian-Ordovician, Triassic, and Tertiary rocks are mapped. Metamorphism and intense deformation characterize the area. Sections are measured; analyses are made. Stone, feldspar, kaolin, quartz, and iron ore are the mineral resources present.
19. Igneous complex of Pennsylvania-Maryland Blue Ridge-Piedmont provinces [abs.]: Geol. Soc. Amer., Proc. 1934, p. 440, 1935.
20. The pre-Cambrian igneous rocks of eastern Pennsylvania and Maryland: Amer. Geophysical Union, Trans. 16, p. 328-350 (#), illus., 1935. A complete petrologic analysis of various igneous rocks is given. Analyses are made. The rocks are granodiorite, quartz latite, quartz monzonite, rhyodacite, quartz diorite latite, anorthosite, quartz gabbro, andesite, gabbro, basalt, and pyroxenite. They are all related by magmatic differentiation, which is outlined.
21. (and Stose, George Willis). Geology and mineral resources of the Honeybrook and Phoenixville quadrangles [Berks, Chester, and Lancaster Counties], Pennsylvania: U. S. Geol. Survey, Bull. 891, v, 145 p., illus. incl. geol. map, 1938. A complete geologic description of the region is given. Precambrian-Ordovician, and Triassic rocks are mapped. The structures are complex. Sections are measured; fossils are listed. Stone, clay, feldspar, sand and gravel, iron ore, lead and zinc, copper, graphite, and ground water are extensively described.

BASHORE, HARVEY B.

1. The Champlain period in the Susquehanna Valley [Dauphin County]: Science 14, p. 340, 1889. Glacial clay and gravels are described in the valley near Harrisburg. It is 100 feet thick in the gaps and 30 feet thick in the lowlands around Harrisburg. No terraces are present.
2. The Harrisburg terraces: Amer. Jour. Sci. 3rd ser. 47, p. 98-99, 1894. The terraces are described. No interpretation is offered. There are four terraces. The lowest is 28 feet above the river, composed of local boulders and brick clay. The second is 46 feet above the river and is not plainly distinct. It contains gravel with crystalline rock fragments included, with a few feet of silt at the top. The third is 90 feet above the river. It is fine crystalline rock gravel with a few large boulders and is capped with clay. The fourth terrace is 130 feet above the river. It is gravel and is capped with clay.
3. Notes on glacial gravels, in the lower Susquehanna Valley: Amer. Jour. Sci. 4th ser. 1, p. 281-282, 1896. Glacial flooding evidence is described in the Juniata and lower Susquehanna Rivers. No evidence of glacial gravel is found above the highest terrace or 140 feet above the river.

BASSLER, HARVEY. See Swartz, Charles Kephart, 1.

BASSLER, RAYMOND SMITH. See also Ulrich, Edward Oscar, 2, 6, 7.

1. (and Ulrich, Edward Oscar). A revision of the Paleozoic Bryozoa—Part 1, On genera and species of Ctenostomata: Smithsonian Misc. Collections 45, p. 256-294, illus., 1904; — Part 2, On the genera and species of Trepostomata: 47, p. 15-55, illus., 1904. Descriptions of bryozoans from the Commonwealth are included. Most are lower Paleozoic.
2. Bibliographic index of American Ordovician and Silurian fossils: U. S. Natl. Museum, Bull. 92, 2 vols., 1521 p., 1915. This is an alphabetical listing of known genera and species. It includes authors, publications, stratigraphic level, and geographic location. The Commonwealth is included.
3. Cambrian and Ordovician: Md. Geol. Survey. 242 p., illus., 1919. Constant reference is made to sections in the Commonwealth for correlation purposes. Paleogeographic maps include the Commonwealth.
4. Memorial of August F[rederick] Foerst [1862-1936]: Geol. Soc. Amer., Proc. 1936, p. 143-157, port., 1937.
5. Memorial to Edward Oscar Ulrich [1857-1944]: Geol. Soc. Amer., Proc. 1944, p. 331-351, ports., 1945.

BASTIN, EDSON SUNDERLAND

1. Economic geology of the feldspar deposits of the United States: U. S. Geol. Survey, Bull. 420, 85 p., illus. incl. geol. map, 1910. A general discussion of the feldspar industry includes a brief description of the occurrences in Chester and Delaware Counties. It comes from pegmatites of the usual granitic type and soda pegmatites. The pegmatites are in Ordovician or older rocks. Individual deposits are described.

BATES, THOMAS FULCHER

1. (and Gruver, Robert M. and Yuster, Samuel Terrill). Influence of clay content on water conductivity of oil sands: Oil Weekly 123, no. 8, p. 48-50, illus., 1946; reprinted with title, The clay content of oil sands: Producers Monthly 10, no. 10, p. 16-19, illus., 1946; reprinted *as* Pa. State College Mineral Industry Experiment Sta., Tech. Paper 120, 1947. Porosity- and permeability-offending clay in the Bradford sand is analyzed by differential thermal analysis, x-ray, and the electron microscope. The chief clay is illite, with some kaolinite and bentonite. Strongly absorbed organic material is also present.
2. Investigation of the micaceous minerals in slate [Lehigh-Northampton Counties]: Amer. Mineralogist 32, p. 625-636, illus., 1947. Chemical analyses and thermal tests indicate that a mineral of the illite group is the chief component of the slate. It resembles sericite. In the "hard" slate it is more metamorphosed than in the "soft" slate. The alignment of the illite flakes by metamorphism is the cause of the slaty cleavage.
3. (and others). Properties and new uses of Pennsylvania slate: Pa. State College Mineral Industry Experiment Sta., Bull. 47, vii, 167 p., illus., [1947]. A complete, detailed description of the slate industry includes chapters on occurrence and mineralogy. It occurs in York, Lancaster, Lehigh, and Northampton Counties; the latter two are the more important. Quartz and sericite are important components. Mica is also common, as is chlorite and a few other less important minerals. Analyses are given.

BATHER, FRANCIS ARTHUR. See also Girty, George Herbert, 1.

1. Obituary, Samuel A[lmond] Miller [1837-1897]: Geological Mag. 4th ser. 5, p. 192, London, 1898.
2. Charles Emerson Beecher [1856-1904]: Geol. Soc. London, Quarterly Jour. 61, Proc., p. xlix-1, 1905.

BAUER, MAX

1. Untersuchung uber den Glimmer und verwandte Minerale: Annalen Physik u Chemie 138 [5th ser. 18], p. 337-370, Leipzig, 1869. In a monographic study, a biotite from Easton (Northampton County) is analyzed chemically and optically.

BAYLES, ROBERT ELLERY. See also Fettke, Charles Reinhard, 27.

1. Subsurface Upper Devonian sections in southwestern Pennsylvania: Amer. Assoc. Petroleum Geologists, Bull. 33, p. 1682-1703, illus., 1949. Well cuttings and logs are studied. Upper Devonian sea regression was northeastward. The Upper Devonian Chemung producing-sands pass into the Catskill facies eastward. Some sands pass westward into shales. The westernmost Devonian inliers are Upper Devonian. The top beds of the Catskill Formation are everywhere contemporaneous. The base of the formation becomes younger westward.

BAYLEY, WILLIAM SHIRLEY. See also Ries, Heinrich, 5.

1. A peculiar hematite ore on the tract of the Durham mine, Durham [Bucks County], Pennsylvania: Economic Geology 7, p. 179-184, 1912. An ore in the gneisses of the Precambrian is predominantly hematite. This ore is usually in Precambrian sedimentary rocks. Quartz is mixed with it. It may be a pegmatitic quartz vein into which hematite was introduced later.
2. Pre-Cambrian geology and mineral resources of the Delaware Water Gap and Easton quadrangles, New Jersey and [Bucks-Northampton Counties] Pennsylvania: U. S. Geol. Survey, Bull. 920, v, 98 p., illus. incl. geol. map, 1941. The Franklin limestone and Pickering gneiss of sedimentary origin have been intruded by what is now the Pochuck gneiss, Losee gneiss, Byram gneiss and pegmatites. All the formations are described and their stratigraphic relations are worked out. Magnetite is the major mineral resource. Hematite, limonite, zinc, pigments, clay, and many minor products are also present.

BEATTIE, H. M.

1. Acme graphite mines and mills [Chester County]: Engineering and Mining Jour. 94, p. 115-118, illus., 1912. Graphite occurs in Precambrian metasedimentary gneisses. It was deposited as carbonaceous material and altered to graphite by metamorphism and pegmatites. Quartzite is present also. The deposit is described.

BECHDOLT, A. F.

1. Influence of geologic structure on history of United States: Minn. Acad. Nat. Sci., Bull. 2, p. 72-86, 1881. This is a popular account of the physiography of the Commonwealth and the effects of the topography on westward migration.

BECK, GEORGE C. See Salisbury, Samuel H., Jr., 1.

BECK, HERBERT HUEBENER

1. The minerals of Lancaster County: 1st ed., Linnean Society, Lancaster, 1912; 3rd ed., Science Press, Lancaster, 1952. This is a catalogue of minerals and their localities, categorized by chemical composition.
2. Prolonged drouth uncovers geologic phenomenon [Lancaster County]: Pa. Dept. Internal Affairs, Monthly Bull. 16, no. 2, p. 3-6, illus., 1948. Low water in the Susquehanna River reveals extremely large potholes in the Triassic diabase dikes which cross the river.
3. The potholes of Conewago Falls [Lancaster County]: Pa. Acad. Sci., Proc. 22, p. 127-130, illus., 1948. Large potholes in Triassic diabase are described when exposed by low water in the Susquehanna River. They are very large and numerous.

BECK, ROBERT W.

1. Lower Mississippian formations of North America: M.S. thesis, Univ. Chicago, 1934.

BECK, T. ROMEYN

1. [Coal analysis from Wayne County]: Amer. Jour. Sci. 13, p. 381-382, 1828. Coal [?] from near Covington is analyzed in general terms. It is predicted to be of commercial use when transportation becomes available.

BEECHER, CHARLES EMERSON

1. Ceratocaridae from the Upper Devonian measures in Warren County: Pa. Geol. Survey 2nd, P3, p. 1-22, illus., 1884. Three genera, *Echinocaris, Elymocaris,* and *Tropidocaris,* the latter two new, are described by six species from the Chemung Formation and Waverly group. They are illustrated.
2. A spiral bivalve shell from the Waverly group of [Warren County] Pennsylvania: New York State Museum, Ann. Rpt. 39, p. 161-164, illus., 1886. A boring mollusk, probably a pelecypod, is named *Spirodomus insignis;* it is described and illustrated.
3. Othniel Charles Marsh [1831-1899]: Amer. Jour. Sci. 4th ser. 7, p. 403-428, port., 1889; Amer. Geologist 24, p. 135-157, port., 1899; Geol. Soc. Amer., Bull. 11, p. 521-537, 1900.
4. James Dwight Dana [1813-1859]: Amer. Geologist 17, p. 1-16, port., 1896.
5. Notes on a new xiphosuran from the upper Devonian of [Warren County] Pennsylvania: Amer. Geologist 29, p. 143-146, illus., 1902. *Prestwichia randalli* is described and illustrated from the sandstone of the upper Chemung Formation near Ackley Station. Only the head is present.
6. Revision of the Phyllocarida from the Chemung and Waverly groups of [Warren County] Pennsylvania: Geol. Soc. London, Quarterly Jour. 58, p. 441-449, illus., 1902. Three genera and six species are described and illustrated. This adds to the phyllocarid fauna already known from the area.

BEEDE, J. W.

1. Age and development of the red beds and terrestrial vertebrates of the Appalachian and Kansas-Texas sections: Geol. Soc. Amer., Bull. 33, p. 671-688, 1922. The fauna, largely amphibians and reptiles, is listed and discussed. The Upper Pennsylvanian and Lower Permian sediments are described from both regions. The flora is also listed and discussed. Red beds occur in the Conemaugh Formation and above. The faunal and floral analyses agree. The *Schwagerina* zone is the base of the Permian. The oldest red beds of the western areas are approximately Conemaugh Formation age. Conditions were probably the same in both areas.

BEERS, FREDERICK W.

1. (and others). Atlas of the oil region of Pennsylvania: [ii], 48 maps, scale varies, about 1 inch per mile, [priv. pub.] New York, c. 1865. An atlas of land maps of northwestern Pennsylvania includes two pages of text regarding the knowledge of petroleum at that time. The rocks are considered [Onondaga] and [Chemung] Formations, but the text is not clear.

BEHRE, CHARLES HENRY, JR. See also Miller, Benjamin LeRoy, 33, 46.

1. Structures in the slates of [Northampton County] northeastern Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 35, p. 100-101, 1924; Pan-Amer. Geologist 41, p. 149-150, 1924.
2. Taconic folding in the Martinsburg shales [Lehigh-Northampton Counties] [abs.]: Geol. Soc. Amer., Bull. 36, p. 157-158, 1925; Pan-Amer. Geologist 43, p. 152-153, 1925.
3. Observations on structures in the slates of Northampton County, Pennsylvania: Jour. Geology 34, p. 481-506, illus., 1926. The Martinsburg shale is strongly folded, overturned northward, and plunging northeast or southwest. Cleavage is strongly developed. Large thrust faults, small normal faults, and bedding slip faults are common. The faults are later than the cleavage.
4. Slate in Northampton County, Pennsylvania: Pa. Geol. Survey 4th ser., M9, xii, 308 p., illus. incl. geol. map, 1927. Cambrian-Silurian rocks are present. The Ordovician Martinsburg Formation is over 8000 feet thick. A lower (soft) shaly slate unit which grades into a middle slaty, clay-slate, quartzitic member, and an upper more carbonaceous unit, now altered to (hard) slate, are present. The structure and metamorphism are discussed in detail. Quarrying economics are described. Individual quarries are described.
5. Geologic factors in the development of the eastern Pennsylvania slate belt: Amer. Inst. Mining and Metallurgical Engineers, Tech. Pub. 66, 17 p., illus., 1928; Trans. 76, p. 393-410, illus., 1928; discussions, p. 410-412. The stratigraphy of the Martinsburg Formation is discussed; of three members, the middle contains the most slate. It is tightly folded. Correlation is made by cyclic repetition of units. The relation of plunge, cleavage, overburden, etc. to mining methods is discussed. The relations of the structures to the quarrying are very important.
6. Martinsburg formation of [south-] eastern Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 39, p. 200-201, 1928; Pan-Amer. Geologist 49, p. 153, 1928.
7. The petrography of some slates [abs.]: Ohio Acad. Sci., Proc. 8, p. 171, 1928; Ohio Jour. Sci. 28, p. 149, 1928.
8. The Bangor-Pen Argyl slate region [Lehigh-Northampton Counties], Pennsylvania, *in* Mineral deposits of New Jersey and eastern Pennsylvania, by C. P. Berkey: Internatl. Geol. Cong., 16th, U. S. 1933, Guidebook 8, Excursion A-8, p. 15-30, illus., 1932. A generalized description of the slate region is given. The slate is in the Martinsburg Formation. Petrology and structure are discussed in detail. Folding, faulting, cleavage, and joints are important in the economic recovery of the slate.
9. Slate in Pennsylvania: Pa. Geol. Survey 4th ser., M16, 400 p., illus., 1933. A detailed description of the structure, origin, composition, technology, and economic geology of slate is given. Slate occurs in the Precambrian rocks of Adams County, in the Hamilton Formation of Carbon County, in the Martinsburg Formation of Dauphin, Berks, Lebanon, Lehigh, and Northampton Counties, and in the Precambrian complex of Lancaster and York Counties. Sections are measured.
10. Slate, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., G48, p. 388-391, 1939. A brief description of the slate industry; an abridgement of Behre (1933).

BELL, JAMES E. See White, Clyde B., 1.

BELL, JANE

1. A study of zones of metamorphism in the Wissahickon schist by means of heavy mineral analysis: M.A. thesis, Bryn Mawr College, 1940.

BENGE, ELMER

1. The occurrence of quartz crystals at Hintner's limonite pits, Marble Hall, Montgomery County, Pennsylvania: Mineral Collector 6, p. 141-145, 1889. Quartz crystals in quartz matrix are described and attributed to shaping by underground water.

2. (and Wherry, Edgar Theodore). Directory of mineral localities in and around Philadelphia: Mineral Collector 12, p. 1-3, [Philadelphia County] 49-51, illus., 65-67, illus., 89-91, 105-107, 119-121, 139-142, illus.; correction with title, Some misnamed local minerals [Philadelphia and Delaware Counties], by E. T. Wherry, p. 155-160, 1905; [Bucks County] 13, p. 7-10, illus., 21-24, illus., [Montgomery County] 41-43, 60-62, 66-67, illus., 91; additions and corrections [Philadelphia County] 92-93, [Bucks County] 109-110, [Montgomery County] 110-111, [Delaware County] 129-132, 151-154, 161-163, 183-184, 1906-07; 14, p. 5-7, 25-27; additions and corrections [Philadelphia County], p. 42, [Bucks County] 42, [Montgomery County] 42, [Delaware County] 43, 1907; [Chester County] 15, p. 6-8, 26-29, 44-46, 54-56, 69-70, 85-86, 1908; additions and corrections [Philadelphia County], p. 107-108, [Bucks County] 108, [Montgomery County] 108, [Delaware County] 108-109, [Chester County] 109, 1908. This is a list of minerals and their locations in the various counties. Some locations are better described than others; many are no longer extant.

BENJAMIN, MARCUS

1. Edward Drinker Cope, paleontologist, 1840-1897, *in* Leading American Men of Science, ed. by D. S. Jordan: p. 313-340, port., Holt and Co., New York, 1910.

BENNETT, JOHNSON

1. Devonian shale and Oriskany sand drilling in . . . Pennsylvania . . . , *in* Appalachian Geological Society, Oriskany Sand Symposium: p. 31-58, 1937. Tables are presented by county to show drilling records into the Devonian in 1937 and earlier. Formation elevations are included.

BENSON, FRANCIS M.

1. The brachiopods of the Greenbrier limestone near Uniontown [Fayette County], Pennsylvania: Pa. Acad. Sci., Proc. 8, p. 62-65, 1934. Twenty-three brachiopods, mostly Productacea, Spiriferacea, and Rostrospiracea are listed. None are new.

BERCKHEMER, FRITZ. See Van Tuyl, Francis Maurice, 1.

BERKEY, CHARLES PETER. See also Ashley, George Hall, 47.

1. James Furman Kemp [1859-1926]: Engineering and Mining Jour. 122, p. 872-873, 1926; Mining and Metallurgical Soc. Amer., Bull. 186 (19, no. 5), p. 114-116, 1926; Science ns 64, p. 639-642, 1926.
2. (and others). Mineral deposits of New Jersey and eastern Pennsylvania: Internatl. Geol. Cong., 16th, U. S. 1933, Guidebook 8, Excursion A-8, 54 p., illus. incl. geol. map, 1932. Contains papers by numerous authors which are cited separately.
3. Douglas Wilson Johnson (1878-1944): Amer. Phil. Soc., Yearbook 1944, p. 374-379, 1945.

BERLIN, ALFRED FRANKLIN

1. The Bake Oven knob [Lehigh County]: Lehigh County Hist. Soc., Proc. 1922, p. 44-48, 1922. A large depression on the south side of Blue Mountain is described. Its theories of origin are outlined. A glacial waterfall from Blue Mountain seems most likely. It is presented in a popular manner.

BERMAN, JOSEPH

1. Muscovite-plagioclase-symplectite of the Philadelphia [Delaware County] area: Pa. Acad. Sci., Proc. 12, p. 89-93, illus., 1938. Symplectite, which is an intergrowth of phengitic muscovite and vermicular plagioclase, from the Springfield granodiorite is described. The myrmekitic structure came later than the mechanical deformation of the rock.

BERRY, CHARLES THOMPSON

1. *Ophiomusium calathospongum* from the Mississippian of [Venango County] Pennsylvania: Acad. Nat. Sci. Phila., Notulae Naturae 24, 4 p., illus., 1939. An ophiuroid starfish is found associated with a sponge in the shale of the Penn-York embayment.

BERTELET, P. G.

1. [Geological features of Oley Valley, Berks County]: Medical Soc. Pa., Trans. ns 1, p. 47, map, 1856. A very generalized description of the area is given. [Cambrian-Ordovician] rocks are mapped. The valley is underlain by marble, and the northern hills by [Cambrian] sandstone.

BERTRAND, J. H., JR.

1. Another rare mineral from Easton, Northampton County, Pennsylvania: Rocks and Minerals 22, p. 416-417, 1947. Uranotile crystals in calcite-filled vugs in a quarry near Easton are described.

BERTRAND, PAUL. See Darrah, William Culp, 2.

BÉTHUNE, PIERRE F. de. See also Longwell, Chester Ray, 2.

1. Geomorphic studies in the Appalachians of Pennsylvania: Amer. Jour. Sci. 246, p. 1-22, illus., 1948. Appalachian drainage was reorganized at the time of the Schooley peneplain uplift, and became superimposed from several floodplains which had developed on downwarped areas. The floodplains converged northwestward and southwestward. The necessity for several stages of uplift is questioned.

BEVAN, ARTHUR CHARLES

1. Outline of the Pennsylvanian of the Appalachian region: Kans. Geol. Soc., Guidebook 6th Ann. Field Conf., p. 121-124, 1932. A brief review of Pennsylvanian stratigraphy is given for purposes of comparison with other areas.
2. Problems of Appalachian geology [abs.]: Geol. Soc. Amer., Bull. 50, p. 1946-1947, 1939.
3. Memorial to Charles Butts [1863-1946]: Geol. Soc. Amer., Proc. 1947, p. 125-129, port., 1948.

BEVIER, G. M.

1. Present status of the copper development in the South Mountain [Adams-Franklin Counties] region: Pa. Topog. Geol. Survey [3rd ser.], Bien. Rpt. 1912-14, p. 55-69, illus., 1914. Copper ore is found in greenstone and occurs at or near contacts with acid volcanic rocks. Native copper and various secondary ores are common. Individual deposits are described. The ore was probably an original sulphide constituent of the basic lava flows which was altered by the later acid lava flows.

BIEMESDERFER, GEORGE K. See also Sampson, Edward, 1.

1. Structural observations on the Peach Bottom slate belt, Lancaster County, Pennsylvania, east of the Susquehanna River: M.A. thesis, Columbia Univ., 1948.

BILGRAM, HUGO

1. Inclusions in quartz [Bucks County]: Acad. Nat. Sci. Phila., Proc. 55, p. 700, 1904. "Blue quartz" contains inclusions of particles suspended in liquid-filled cavities. The particles are so small they exhibit Brownian movement.

BILLIN, CHARLES E. See Platt, Franklin, 16.

BILLINGS, JOHN SHAW

1. Memoir of Spencer Fullerton Baird, 1823-1887: Natl. Acad. Sci., Biog. Mem. 3, p. 141-160, port., 1895.

BILLINGS, M. HEWITT

1. Origin of the thick Freeport coal of Allegheny County, Pennsylvania: M.S. thesis, Univ. Pittsburgh, 1931.

BILLINGS, MARLAND PRATT

1. (and Williams, Charles Regan). Origin of the Appalachian Highlands: Appalachia 19, no. 1; Appalachian Mountain Club, Bull. 25, no. 10, p. 1-33, illus., 1932. This is a popular account of the geological history of the entire Appalachian System. Pennsylvania is included.

BILLINGS, WALTER R.

1. Death of a distinguished American amateur geologist and paleontologist—S[amuel] A[lmond] Miller [1837-1897]: Ottawa Naturalist 11, p. 208, 1898.

BILLINGSLEY, JAY EDGAR

1. Early development of theories, *in* Symposium on geological prospecting for oil and gas in the Appalachian area: W. Va. Univ., Bull., ser. 45, no. 3-II, p. 126-130, 1944. A review of the literature, mostly from the Commonwealth, of the theories of petroleum accumulation is given.

BILLINGSLEY, PAUL

1. Structure, origin, and stratigraphic significance of the Shawangunk grit [abs.]: Science ns 32, p. 125-126, 1910.

BIRKINBINE, JOHN, 1844-1915.

1. The iron ores of the United States: Franklin Inst., Jour. 126 [3rd ser. 96], p. 190-208, 1888. A review of the various kinds of ores from different places,

includes the Commonwealth. It includes a general description of the occurrence and associations. No details are included. Magnetite, hematite, limonite, and siderite are the ores mentioned.

2. Notes upon American iron ore deposits . . . : Iron and Steel Inst. in America in 1890, Special vol. of "Proc.," p. 361-402. London, 1892. A review of iron-ore occurrences in the United States includes the deposit at Cornwall [Lebanon County] as one of the major producers.

BISSELL, MALCOLM H.

1. The Triassic area of the New Cumberland quadrangle [York County], Pennsylvania: Ph.D. thesis, Yale Univ., 1921.

BLAKE, JOHN M. See Johnson, S. W., 1.

BLAKE, WILLIAM PHIPPS, 1826-1910. See also Hitchcock, Charles Henry, 5, 6.

1. Optical and blowpipe examination of the supposed chlorite of Chester County, Pa.: Amer. Jour. Sci. 2nd ser. 12, p. 339-341, illus., 1851. The name clinochlore is given to a chlorite-like mineral which has peculiar optical properties. The mineral is described in detail. The location is 3 miles south of West Chester, in serpentine.
2. Mineralogical notices: Amer. Jour. Sci. 2nd ser. 13, p. 116-117, 1852; addition, 14, p. 105, 1852. Argentiferous galena is reported from the Wheatley mine, near Phoenixville, Chester County. Associated with it are carbonate, sulphate, phosphate, and chromate of lead. Also found is pyromorphite and cerasite. Chalcotrichite is found filling cavities in copper sulphate in the Perkiomen, Montgomery County, area. Nickel sulphide is reported associated with massive chromium ore, emerald nickel, and "violet talc." It is from Lancaster County; no further location is given.
3. On the occurrence of crystallized carbonate of lanthanum [Lehigh County]: Amer. Jour. Sci. 2nd ser. 16, p. 228-230, illus., 1853. Lanthanite is described chemically and physically. It is associated with the zinc ores of the Saucon Valley near Bethlehem.
4. Lanthanite and allanite in Essex County, N. Y.: Amer. Jour. Sci. 2nd ser. 26, p. 245-246, 1858. Allanite is mentioned as having been possibly associated with lanthanite in Lehigh County. The lanthanite probably formed from the slow decomposition of the allanite, but the latter is not actually found.
5. The Wheatley silver lead mines [Chester County]: Mining Mag. and Jour. Geology 2nd ser. 1, p. 411-418, illus., New York and New Haven, 1860. A brief description of the deposit is given. A group of parallel veins of igneous origin contain much argentiferous galena and other lead minerals. They have invaded both [Precambrian] and [Triassic] rocks and are probably late [Triassic] in age.

BLANDY, JOHN F., 1833-1903.

1. On evidence of streams during deposition of coal [Armstrong County]: Amer. Inst. Mining and Metallurgical Engineers, Trans. 4, p. 113-116, illus., 1876; Engineering and Mining Jour. 21, p. 392-393, 1876; discussion by R. W. Raymond, p. 116. [Pennsylvanian] streams which cut into coal beds are mapped and their courses determined.
2. The Lake Superior copper rocks in [Adams-Franklin Counties] Pennsylvania: Amer. Inst. Mining Engineers, Trans. 7, p. 331-333, 1879; discussion by T. S. Hunt and P. Frazer, p. 333-339, 1879. The copper deposits resemble those of the Lake Superior area. Native copper occurs in amygdules in both. Lithologically, the rocks are very different. Frazer and Hunt claim those in the Commonwealth are not Keewenawan in age.

BLANK, EUGENE W.

1. The old Friedensville zinc mine [Lehigh County]: Rocks and Minerals 6, p. 26-27, 1931. A popular account of the zinc ore occurrence is given. Calamine and sphalerite are mined.

BLISS, ELEANORA FRANCES

1. Glaucophane from eastern [Berks County] Pennsylvania: Amer. Museum Nat. Hist., Bull. 32, p. 517-526, illus., 1913. Blue glaucophane is described from the Precambrian rocks in the Reading Prong. It is completely described chemically and optically. It could result from the replacement of lime in actinolite or hornblende by iron. It could also be the result of the weathering of hornblende. It occurs in a variety of rocks.

2. (and Jonas, Anna Isabel). Relation of the Wissahickon mica gneiss to the Shenandoah limestone and to the Octoraro mica schist of the Doe Run-Avondale district, Coatesville quadrangle, [Chester County] Pennsylvania: Ph.D. thesis, Bryn Mawr College, 64 p., illus. incl. geol. map, [? priv. pub.], 1914; U. S. Geol. Survey, Prof. Paper 98-B, p. 9-34, illus. incl. geol. map, 1916. Precambrian-Ordovician, and Triassic rocks are mapped. The Octoraro schist gradationally overlies the Shenandoah (Ordovician) limestone. A thrust-fault occurs between the Octoraro schist and the Precambrian Wissahickon gneiss.
3. Relation of former drainage channels to the topography of eastern Pennsylvania and Maryland [abs.]: Geol. Soc. Amer., Bull. 35, p. 77, 1924; Pan-Amer. Geologist 41, p. 141, 1924.

BLODGETT, J. B.

1. (and others). On the clays and gravels underlying the city [Philadelphia County]: Amer. Phil. Soc., Proc. 16, p. 180-181, 1876; discussion, p. 337-339. Borings and building foundations show that there is gravel with interbedded sand and clay under the city. The thicknesses vary, and the distribution seems irregular.

BLOOD, PEARL

1. A profile study of erosion surfaces in Pennsylvania and Maryland: M.A. thesis, Columbia Univ., 1924.

BOARDMAN, LEONA. See Mansfield, George R., 1.

BOCK, WILHELM

1. A new small reptile from the Triassic of [Montgomery County] Pennsylvania: Acad. Nat. Sci. Phila., Notulae Naturae 154, 8 p., illus., 1945; discussion with title, Notes on *Gwyneddosaurus* by F. von Heune: Amer. Jour. Sci. 246, p. 208-213, illus., 1948. *Gwyneddosaurus erici,* new, is described from fragments in the Lockatong Formation, whose biota is also listed. It may be a theropod, but it is uncertain. Heune thinks it is a *Protorosauria.*
2. New crustaceans from the Lockatong of the Newark series [Montgomery County]: Acad. Nat. Sci. Phila., Notulae Naturae 183, 16 p., illus., 1946. Branchiopod genera *Estheriella* and *Estheria* are described and illustrated. They may correlate the oldest Newark beds with the Muschelkalk of Europe.

BODLE, RALPH ROBINSON

1. United States earthquakes [Lackawanna-Lancaster Counties], 1939: U. S. Coast and Geodetic Survey, serial 637, ii, 69 p., illus., 1941. Shocks near Scranton and Lancaster are described. No damage was done.

BOILEAU, JOHN W.

1. Coal fields of southwestern Pennsylvania, Washington and Greene Counties: 90 p., illus., [priv. pub.], [Pittsburgh ?], 1907. A complete but generalized description of the region is given. [Pennsylvanian-Permian] rocks only are considered. The major structural features are described. The Pittsburgh coal bed is the only one discussed in detail. Analyses are made.

BOLGER, ROBERT C.

1. An investigation of the Mercer clay, Clearfield County, Pennsylvania: M.A. thesis, Washington Univ., St. Louis, 1949.

BOLTON, FREDERICK J.

1. Hummelstown [Dauphin County] brownstone once national favorite—[Part 1]: Pa. Dept. Internal Affairs, Monthly Bull. 14, no. 4, p. 3-8, illus.—[Part 2], no. 5, p. 16-22, illus., 1946. This is a popular account of the Triassic sandstone used extensively as brownstone. Its origin and properties are discussed.

BONINE, CHESLEIGH ARTHUR

1. An unusual college monument [Centre County]: Amer. Mineralogist 14, p. 200, 1929. The Polylith monument on the campus of the State University contains 281 different rock types from 150 localities in the Commonwealth. After 33 years, weathering effects are mentioned and compared.
2. (and Honess, Arthur Pharaoh). Bentonite in Pennsylvania: Pa. Acad. Sci., Proc. 3, p. 18-25, 1929; Pa. State College Mineral Industry Experiment Sta., Bull. 5, 8 p., 1929. Several beds of bentonite occur in the Trenton limestone in central Pennsylvania. Its volcanic origin is established. A section is measured; analyses are given.

BORDEN, HENRY CLAY
1. The minerals of the Avondale and Leiperville [Chester County] localities: Mineral Collector 5, p. 68-71, 1898.

BORHEK, HENRY T.
1. An attempt to determine the preglacial course of the Manokisy (Monocacy): Thesis, Lehigh Univ., 34 p., illus., 1899.

BOUCOT, ARTHUR JAMES
1. Notes on the Ecton mine, Montgomery County, Pennsylvania: Rocks and Minerals 24, p. 492-495, illus., 1949. Irregular quartz veins along a fault plane in Triassic sandstone contain hydrothermal galena, sphalerite, and chalcopyrite. Many supergene minerals are also described.

BOUDREAU, ELIZABETH
1. A reconnaissance of the structure and petrology of the Octoraro phyllite [Chester County]: M.A. thesis, Bryn Mawr College, 1948.

BOWEN, ELI
1. The coal regions of Pennsylvania . . .: 72 p., illus., Carvalho and Son, Pottsville, 1848. A review of the coal formations and properties, mostly of the anthracite areas is given. No geologic details are included.
2. [The anthracite coal formation], p. 120-235, Part 2 *of* The pictorial sketch book of Pennsylvania: 268 p., illus., Hazard, Philadelphia, 1852. A popular account of travels in the Commonwealth includes descriptions of the coal-bearing rocks.
3. The McGinnes theory of the Schuylkill coal formation . . .: 56 p., Pottsville, 1855, [not seen].
4. Coal and the coal trade—a series of letters on the origin of coal and oil springs . . . with a geological cross section from the Locust Mountain to the Sharp Mountain: 36 p., illus., Peterson Bros., Philadelphia, 1862. A generalized description of coal and coal strata includes examples from the Commonwealth.

BOWLES, OLIVER
1. William Clifton Phalen [1877-1949]: Mining Engineering 1, no. 9, p. 65, 1949.

BOWNOCKER, JOHN ADAMS, 1865-1928. See also White, Israel Charles, 29.
1. Geology as applied to the formations in which natural gas is found in the Appalachian regions: Natural Gas Assoc. Amer., Proc. 1, p. 491-507, illus., 1909; Amer. Gas Light Jour. 90, p. 1160-1163, illus., 1909; Progressive Age 27, p. 541-544, illus., 1909. The section from Cambrian to Permian is discussed in western Pennsylvania. All periods are gas-producing except the Permian. The Devonian is the largest producer. Anticlines control its accumulation.
2. Depletion of natural gas in the Appalachian field: Natural Gas Assoc. Amer., Proc. 14th Ann. Meeting, p. 253-272, illus., 1920. A brief description of the gas situation in the Commonwealth is given. Devonian sands are the big producers in the north, whereas Mississippian rocks are the big source of gas in the south. A generalized cross section is included.

BOYD, CHARLES RUFUS
1. Remarks on the coal measures and oil produce of the United States of America: North of England Inst. Mining Engineers, Trans. 25, p. 145-167, illus. incl. geol. map, Newcastle-on-Tyne, 1876; discussions, p. 167-175. A brief review of the industries in the United States includes the Commonwealth. Some comparative [Pennsylvanian] sections are included.

BOYÉ, MARTIN H.
1. Analyses of a magnetic iron pyrites containing nickel from Gap mine, Lancaster County, Pennsylvania: Amer. Jour. Sci. 2nd ser. 13, p. 219-222, 1852. A detailed chemical analysis is given, complete with technique. Iron, nickel, copper, and lead are present, as is sulphur.

BRADLEY, FRANK HOWE, 1838-1879.
1. Geological chart [map] of the United States east of the Rocky Mountains and of Canada, compiled in 1875: No scale given, 16 x 24 inches, New York, 1876.

BRAINERD, JEHU
1. On quartz pebbles, of the sandstone conglomerate, and reasons for rejecting the theory of "water detrition": Amer. Assoc. Adv. Sci., Proc. 5, p. 222, 1851; discussion by B. S. Lyman: Acad. Nat. Sci. Phila., Proc. [18] 1866, p. 107-108, 1866. A general discussion shows that the [Pottsville Formation] was

deposited by crystallization from a solution and is not detrital. Lyman recognizes *Calamites*-resembling glacial striae from Luzerne County to discuss a specific point.

BRANNER, JOHN CASPER, 1850-1922.

1. Origin of the Pottsville and other conglomerates [abs.]: Amer. Jour. Sci. 3rd ser. 32, p. 324, 1886.
2. The glaciation of parts of the Wyoming and Lackawanna valleys [Luzerne-Lackawanna Counties]: Amer. Phil. Soc., Proc. 23, p. 337-357, illus., 1886. Glacial features in the valleys are described. Striations, drift, kettle-holes, boulders, effect on soil, potholes, and water abrasion are considered. The effect of topography on the flow of ice is considered.
3. The thickness of the ice in [Wayne County] northeastern Pennsylvania during the glacial epoch: Amer. Jour. Sci. 3rd ser. 32, p. 362-366, 1886. Elk Mountain has been glaciated at its summit, suggesting that the ice was at least over the top of it. Its elevation is 2700 feet.
4. Glaciation—its relations to the Lackawanna-Wyoming [Counties] region: Lackawanna Inst. Hist. Sci., Proc. 1, p. 3-18, 1887. An address describes the glaciation of the area and the evidence for it.
5. Notes upon the glacial striae observed in the Wyoming-Lackawanna [County] region: Lackawanna Inst. Hist. Sci., Proc. 1, p. 19-27, 1887. Description and directions of striae in the area are given. Almost all have a NE-SW direction.

BRANNT, WILLIAM T.

1. Petroleum—its history, origin, occurrence . . .: xxvii, 715 p., illus., Baird and Co., Philadelphia, 1895. A treatise contains many examples from the Commonwealth.

BRAUN, EMMA LUCY

1. Development of the deciduous forests of eastern North America, *in* Botanical Soc. Amer., Paleobot. and Systematics Secs., Origin and development of natural floristic areas, with special reference to North America: Ecological Monographs 17, p. 211-219, 1947. The Commonwealth is included in a description of the development of the forests. The period from the Cretaceous to Recent is considered. The Pleistocene was a big influence.

BRETZ, J. HARLEN

1. The physiography of North America, *in* Geology of North America 1, by R. Ruedemann and R. Balk, [part] *of* Geologie der Erde, ed. by E. Krenkel: p. 1-40, illus., Borntraeger, Berlin, 1939. A very cursory description includes the Commonwealth.

BREWER, CHARLES. See Torrey, Paul Dwight, 3.

BRIGHAM, ALBERT PERRY

1. The Appalachian Valley: Scottish Geog. Mag. 40, p. 218-230, Edinburgh, 1924. A general description of the geology and physiography of the Great Valley includes the Commonwealth. Its drainage is described, and the influence on the early settlers is outlined.

BRINTON, D. G.

1. Memoir of S[amuel] S[tehman] Haldeman [1812-1880]: Amer. Phil. Soc., Proc. 19, p. 279-285, 1881.

BRITTON, J. BLODGET

1. Phosphorus in the ashes of anthracite coal: Amer. Inst. Mining Engineers, Trans. 1, p. 298-300, 1873. Analyses of coal from many places show that phosphorus is present in significant quantity.

BRODHEAD, L. W.

1. The Delaware Water Gap [Northampton County]; its scenery, its legends and early history: 2nd ed., 276 p., illus., Philadelphia, 1870. "An appreciative description of the Delaware Water Gap with a fantastic explanation of its origin. It is believed to have been formed by pressure of the waters of a great lake breaking through the rocks of the mountains."—B. L. Miller.

BROEDEL, CARL HUNTINGTON. See Cloos, Ernst, 4.

BRONGNIART, ADOLPHE

1. Histoire des vegetaux fossiles: Vol. 1, 488 p., illus., Paris, 1828; Vol. 2, 72 p., illus., Paris, 1835. A monograph includes many genera and species from the Mauch Chunk area in Carbon County.

BROOKS, STANLEY TRUMAN

1. Molluscs from the Harmonsburg [Crawford County] (Pa.) marl.: Carnegie Museum, Annals 24, p. 59-60, 1935. Marl from the old post-Pleistocene Lake Conneaut contains seven genera and thirteen species of gastropods which are listed.

BROOKS, WILLIAM KEITH

1. Joseph Leidy [1823-1891]: Popular Science Monthly 70, p. 311-314, port., 1907.

BROWN, AMOS PEASLEE, 1864-1917.

1. Modes of occurrence of pyrite in bituminous coal: Amer. Inst. Mining Engineers, Trans. 16, p. 539-546, 1888. Pyrite is common in the coals of western Pennsylvania. It occurs as nodules, lenticular masses, stratified bands, flakes, coatings, and particles. Examples of each are given from various parts of the Commonwealth.
2. The crystallization of molybdenite [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [48] 1896, p. 210-211, illus., 1896. Crystals of this mineral are described from near Frankford. Crystals are generally rare.
3. [The red color of certain northeastern Pa. formations] [abs.]: Amer. Geologist 17, p. 262, 1896.
4. New cycads and conifers from the Trias of [Bucks County] Pennsylvania: Acad. Nat. Sci. Phila., Proc. 63, p. 17-21, illus., 1911. Four genera and six species are described from a quarry in the Stockton Formation. Four species are new.
5. (and Ehrenfield, Frederick). Minerals of Pennsylvania: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 9, 160 p., illus., 1913. A brief account of the useful minerals of the Commonwealth is given. Locations, distribution, and analyses are included.

BROWN, CHARLES WILSON

1. The geology of Lower Milford township, Lehigh County, Pennsylvania: Rocks and Minerals 23, p. 212-215, 323-326, 401-406, illus., 1948. A complete geologic description of the area is given in a popular account. Precambrian-Cambrian, and Triassic rocks are described. Faults and folds characterize the area. Limestone is the only economic product discussed.

BROWN, EDWIN AUGUSTUS

1. (and Roedder, Edwin Woods). Normal faults near Bowmans [Carbon County] Pennsylvania: Pa. Acad. Sci., Proc. 15, p. 93-97, illus., 1941. Normal faults are predicted on the basis of discontinuity of certain ridge-forming sandstones. The throws are rather small (about 300 feet), and the time of faulting is assumed to have been during the Appalachian Revolution.

BROWN, R.

1. [Coupé geologique du pays entre Philadelphia (Philadelphia County) et Norristown, (Montgomery County)]: Soc. géol. France, Bull. 5, p. 429, Paris, 1834. A generalized description of the rocks in the region is given. Physical descriptions are given, but no attempt is made at interpretation.

BROWN, THOMAS CLACHAR

1. Notes on the origin of certain Paleozoic sediments, illustrated by the Cambrian and Ordovician rocks of Center County, Pa.: Jour. Geology 21, p. 232-250, illus., 1913. Flat-pebble limestone conglomerates and oolitic fossil-bearing limestones are in the Upper Cambrian. Overlying these are sandstones and *Cryptozoon*-bearing limestones, over which lies Lower Ordovician limestone. The flat-pebble conglomerates are due to algae, not mechanical action. The calcareous oolites are also a result of algal secretions, whereas the siliceous oolites are a result of replacement. The sand is wind-blown and was deposited during slight emergences of the area.
2. Notes on the Silurian limestone of Milesburg Gap [Centre County] near Bellefonte, Pa.: Amer. Jour. Sci. 4th ser. 35, p. 83-89, illus., 1913. Two limestone formations occur between the Clinton Formation and the Oriskany Formation. Fossils are listed and a historical account of their recognition is outlined. No correlations are made.
3. Origin of oolites and the oolitic texture in rocks [eastern, central Pa.]: Geol. Soc. Amer., Bull. 25, p. 745-780, illus., 1914. A general description of the origin and occurrence of oolites is discussed. Those of the Commonwealth

are cited as specific examples. Included are those in the Beekmantown Formation of Centre County, which are calcareous and siliceous, and the Clinton Silurian oolitic iron ore.

BROWNE, J. B.

1. Singular impressions in marble [Montgomery County]: Amer. Jour. Sci. 19, p. 361, illus., 1831. Small figures, one resembling the Greek "Pi" and another vertical stroke, are described from the [Cambro-Ordovician] limestone north of Philadelphia. No explanation is offered.

BROWNE, PETER A.

1. On the geological character of the beds upon which the city of Philadelphia [Philadelphia County] stands: Monthly Amer. Jour. Geology 1, p. 363-367 1832. Boulders of [Precambrian] rocks in the surficial material are described. It is called "primitive diluvial." A section given, from top to bottom, is (1) soil, (2) loam, (3) yellow sand and clay, (4) clay (irregular distribution), (5) a siliceous, argillaceous, ferruginous zone, and (6) gravel. The total is 16 feet. He attributes it to a flood. Fossils are mentioned, but no details are given.
2. On the rocks found in the vicinity of Philadelphia [Philadelphia County] [abs.]: Monthly Amer. Jour. Geology 1, p. 517-519, 1832. An expanded abstract. The rocks are [Precambrian]; granite is rare except for boulders. Gneiss is described, as well as certain mineral components. No interpretation is given.

BRUCE, ARCHIBALD

1. Description of some of the combinations of titanium occurring within the United States: Amer. Mineralogical Jour. 1, p. 233-243, illus., 1814. Included in a list and description of titanium-bearing minerals is a mention of red titanium oxide on "smoky topaz" [quartz] from Delaware County. Crystals of silico-calcareous titanium oxide [titanite] are found at the Falls of the Schuylkill [Philadelphia County] and in Chester County. No precise locations are given, nor anything more than just a mention.

BRUNNER, D. B. See also Hoskinson, W. S., 1; Knerr, E. B., 2.

1. (and Smith, Edgar Fohs). Some minerals from Berks County, Pa.: Amer. Chemical Jour. 5, p. 279-280, 1884. Stilbite, deweylite, vesuvianite, and titanite are described and analyzed from various places.

BRUSH, GEORGE JARVIS, 1831-1912. See also Dana, James Dwight, 2; Smith John Lawrence, 1; Torrey, John, 1.

1. On a variety of galena from Lebanon County, Pa.: Amer. Jour. Sci. 2nd ser. 35, p. 126-129, 1863. Octahedral argentiferous galena occurs in small masses disseminated in limestone. It cleaves in octahedrons and some cubes. It probably is a pseudomorph after fluorite or a dimorph form of galena.
2. Jefferisite, a new mineral species [Chester County], *in* Mineralogical notices, no. 10, *of* Contributions from the Sheffield laboratory of Yale College: Amer. Jour. Sci. 2nd ser. 41, p. 248, 1866. This mineral was described as vermiculite in Dana's ninth supplement. It comes from a serpentine quarry near West Chester. It is optically different from vermiculite, hence the new name.

BRYAN, KIRK

1. (and Cleaves, Arthur Bailey, and Smith, Harold Theodore Uhr). The present status of the Appalachian problem: Zeitschr. Geomorph. 7, p. 312-320, Leipzig, 1933. A historical review of the ideas to explain the present Appalachian topography is given. Davis, Hayes, Campbell, and others represent the "older viewpoint" of descriptive analysis. Barrell, Johnson and others used organized data and produced the concepts of overlap. A bibliography is included. The problem, like the poor, is still with us.

BRYAN, P. W.

1. Some geographical factors in the northern Appalachian coal fields: Scottish Geog. Mag. 36, p. 232-244, illus., Edinburgh, 1920. A general review of the geology and physiography of western Pennsylvania is given in order to explain coal production figures.

BRYANT, WILLIAM LETCHWORTH

1. On the structure of *Palaeaspis* and on the occurrence in the United States [Perry County] of fossil fishes belonging to the family Pteraspidae: Amer. Phil. Soc., Proc. 65, p. 256-271, illus., 1926. A general treatise on the group includes detailed descriptions of some from the Commonwealth in the Silurian Bloomsburg Formation.

2. New fishes from the Triassic of [Montgomery County] Pennsylvania: Amer. Phil. Soc., Proc. 73, p. 319-326, illus., 1934. Coelocanth and shark remains are described from the Lockatong shale. They are in an excellent state of preservation.

BUCHER, WALTER HERMAN. See also Miller, Benjamin LeRoy, 22.

1. Memorial to Nevin M[elancthon] Fenneman [1865-1945]: Geol. Soc. Amer., Proc. 1945, p. 215-228, port., 1946.
2. Biographical memoir of Douglas Wilson Johnson, 1878-1944: Natl. Acad. Sci., Biog. Mem. 24, p. 197-230, port., 1947.

BUCK, LEONARD J.

1. Availability of limestone in the Allentown quadrangle [Lehigh County] for fluxing purposes: E.M. thesis, Lehigh Univ., 1915.

BUIE, BENNETT FRANK

1. A report of investigations of the Allentown limestone formation: M.S. thesis, Lehigh Univ., 1932.

BUNKER, JAMES MADISON

1. Vegetable origin of anthracite: Amer. Jour. Sci. 24, p. 172-173, 1833. Anthracite, called Schuylkill coal, with partially mineralized wood fragments within, is described, thereby supporting the vegetable origin. No locations are given.

BURCHARD, ERNEST F.

1. Map showing . . . cement plants . . . and principal limestone formations east of the Rocky Mountains . . . Scale, 1:7,000,000, *in* Cement industry in the United States in 1910: Mineral Resources of U. S. 1910, pt. 2, 1911.

BURKART, HERMANN JOSEPH

1. Das Petroleum und seine Production in Nord-Amerika: Berg-und Huttenmanischer Zeitung 29, p. 373-376, Leipzig, 1870. A review is given of the occurrence of petroleum in the United States, mostly about the Commonwealth. No new details are included.

BURKE, J. J.

1. A new species of *Delocrinus* [Allegheny County]: Carnegie Museum, Annals 21, p. 81-91, illus., 1932. *Delocrinus allegheniensis* from the Ames limestone in the Conemaugh Formation is described and illustrated.
2. Tetrapods in the Dunkard series: Science ns 82, p. 153, 1935. A diverse fauna of amphibians and reptiles is reported from two undescribed locations, presumably in southwestern Pennsylvania. No details are given.

BURKE, JAMES M.

1. Geological examination of northern Chester County, Pennsylvania: M.S. thesis, Lehigh Univ., 1921.

BURROUGHS, ELIZABETH HARDING

1. Bibliography of petroleum and allied substances in 1915: U. S. Bur. Mines, Bull. 149, 147 p., 1918; in 1916: Bull. 165, 159 p., 1919; in 1917: Bull. 180, 170 p., 1920; in 1918: Bull. 189, 180 p., 1921; in 1919 and 1920: Bull. 216, 374 p., 1923; in 1921: Bull. 220, 230 p., 1923. An annotated bibliography of the subject includes the Commonwealth for the years mentioned. Only noteworthy articles are included.

BURROUGHS, WILBUR GREELEY

1. The petroleum fields of the United States: Engineering and Mining Jour. 89, p. 921-924, illus., 1910. A general review of the occurrence of petroleum in the various areas of the United States, includes the Commonwealth. Structural highs are the common places for accumulation in the Appalachian region.
2. The Pittsburgh coal bed: Coal Age 5, p. 440-442, illus., 1914. The physical characteristics of the Pittsburgh coal from the southwest counties are described. No specific geographic details are included, however.
3. Geography and stratigraphy of the Susquehanna Basin, in the Towanda region, [Bradford County] Pennsylvania: Ph.D. thesis, Cornell Univ., 1932.
4. Physiographic history of the North Branch of the Susquehanna River in northern Pennsylvania and south-central New York [abs.]: Ky. Acad. Sci., Trans. 5, 1931-32, p. 56, 58, 1933.
5. New discoveries concerning the Devonian delta of the Appalachian geosyncline [Bradford County] [abs.]: Ky. Acad. Sci., Trans. 6, 1933-34, p. 55-56, 1935.

BURROWS, JOHN SHOBER

1. The Barnesboro-Patton coal field of [Cambria County] central Pennsylvania: U. S. Geol. Survey, Bull. 225, p. 295-310, 1904. Pennsylvanian rocks contain five coals which are of economic importance. Each is described in detail.
2. Geology and location of the coal fields of Pennsylvania: Coal Age 6, p. 459-461, illus. incl. geol. map, 1914. A brief review of the [Pennsylvanian] stratigraphy of the Commonwealth with an account of the coal beds is given.

BURTON, S. E.

1. (and Sanford, Robert S.). Investigation of Boiling Springs manganese-iron deposits, Cumberland County, Pa.: U. S. Bur. Mines, Rpt. Inv. 4436, 20 p. (#), illus., 1949. Limonite and manganese ore occur as residual deposits in Cambrian limestone. Drill holes are logged.

BUSCH, DANIEL ADOLPH. See Matteson, Lawrence Stanley, 1.

BUTLER, ROBERT D. See also Fraser, Donald McCoy, 9.

1. Mylonitic sphalerite from Friedensville [Lehigh County], Pa.: Economic Geology 30, p. 890-904, illus., 1935. Sphalerite is examined microscopically and proves to be mylonitized. Apparently it was under stress after its initial formation. The texture of the metamorphosed country rock is not present in the sphalerite.
2. A "red beds" type of copper occurrence, Wyoming County, Pennsylvania: Economic Geology 33, p. 625-634, illus., 1938; Lehigh Univ. Inst. Research, Circ. 145, 1938. Copper minerals are described from Catskill sandstones in the red beds. Mineralized plant remains occur, and the evidence indicates that the copper was emplaced after the metamorphism of the organic material to anthracite and semi-bituminous coal.

BUTTS, CHARLES. See also Campbell, Marius Robinson, 8; Rosenkrans, Robert Russell, 1.

1. Recent structural work in western Pennsylvania [abs.]: Science ns 15, p. 823, 1902.
2. Coal mining along the southeastern margin of the Wilmore basin, Cambria County, Pa.: U. S. Geol. Survey, Bull. 225, p. 325-329, 1904. Along with a description of mining operations is a brief discussion of the Allegheny Formation and the coals it contains. They lie in a deep syncline just west of the Allegheny Front.
3. Description of the Kittanning quadrangle [Armstrong, Butler, and Clarion Counties]: U.S. Geol. Survey, Geol. Atlas of U.S. folio 115, 15 p., illus. incl. geol. maps, 1904 A complete description of the area is given. [Mississippian-Pennsylvanian] rocks are at the surface. Devonian rocks are described from wells. The structure is simple folds. The Pleistocene materials are discussed in detail. Sections are measured, and analyses are made. Coal, petroleum and gas are the major mineral resources. Clay, shale, iron ore, limestone, stone, and sand are also present.
4. Description of the Ebensburg quadrangle [Cambria, Blair, and Bedford Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 133, 9 p., illus. incl. geol. maps, 1905. A complete geologic description of the area is given. Devonian-[Pennsylvanian], and Recent rocks are mapped. The structure consists of very gentle folds. Coal, clay, shale, limestone and stone are the chief mineral resources. Sections are measured.
5. Description of the Rural Valley quadrangle [Armstrong-Clarion Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 125, 11 p., illus. incl. geol. maps, 1905. A complete geologic description is given. [Mississippian-Pennsylvanian], and Pleistocene deposits are mapped. The structure consists of gentle folds. Sections are measured; analyses are made. Several erosion levels are recognized. Coal is the chief mineral resource. Petroleum, natural gas, clay, iron ore, and limestone are also described.
6. Economic geology of the Kittanning and Rural Valley quadrangles [Butler, Clarion, and Armstrong Counties], Pennsylvania: U. S. Geol. Survey, Bull. 279, 198 p., illus. incl. geol. map, 1906. A generalized discussion of the geology precedes a detailed description of the coals in Pennsylvanian rocks, oil and gas in Devonian rocks, and clay, shale, iron ore, limestone, and stone from various surface deposits.

7. The Devonian section near Altoona [Blair County], Pa.: Jour. Geology 14, p. 618-630, illus., 1906. The section is described in detail. The rocks are, from oldest to youngest: Oriskany, Marcellus, Hamilton, Genessee, Nunda, Chemung, and Catskill Formations. Fossils are listed.
8. Pre-Pennsylvanian stratigraphy, *in* Review of general geology of southwestern Pennsylvania in light of recent work: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1906-08, p. 190-204, illus., 1908. Ordovician-Mississippian rocks are discussed in considerable detail; the Lower Devonian, Silurian, and Ordovician rocks are known only from wells. The Missisippian-Pennsylvanian unconformity is described. Correlations are made.
9. The unconformity between the Mississippian and Pennsylvanian, and its bearing on questions of geologic correlation [abs.]: Science ns 27, p. 992-993, 1908.
10. Ganister in Blair County, Pennsylvania: U. S. Geol. Survey, Bull. 380, p. 337-342, 1909. Medina sandstone is very hard and is used for fire brick in the county. It is described, as is its geological occurrence. Analyses are made.
11. Description of the Warren quadrangle [Warren County], Pa.-N. Y.: U. S. Geol. Survey, Geol. Atlas of U. S. folio 172, 11 p., illus. incl. geol. maps, 1910. A complete geologic description of the area is given. Devonian-Pennsylvanian, and Pleistocene rocks are at the surface. Broad folds characterize the structure. Sections are measured. Petroleum and gas are the chief mineral resources. Coal, clay, stone, and sand and gravel are minor products.
12. Faults of unusual character in [Blair County] central Pennsylvania [abs.]: Wash. Acad. Sci., Jour. 6, p. 251, 1916.
13. Geologic section of Blair and Huntingdon Counties, central Pennsylvania: Amer. Jour. Sci. 4th ser. 46, p. 523-537, illus., 1918. A section from the Waynesboro Formation (Cambrian) to the Allegheny Formation (Pennsylvanian) is described. New units are mentioned in detail. Fossils are listed.
14. The Loyalhanna limestone of southwestern Pennsylvania especially with regard to its age and correlation: Amer. Jour. Sci. 5th ser. 8, p. 249-257, illus., 1924. The Loyalhanna limestone is 40-50 feet thick, contains quartz grains, and is cross bedded. The quartz grains seem to be more common than the limestone. It rests on the Pocono Formation. It is correlated with the Ste. Genevieve limestone of the Illinois area on physical and stratigraphic bases.
15. Variation in Appalachian stratigraphy: Wash. Acad. Sci., Jour. 18, p. 357-380, illus., 1928. Detailed correlations of Paleozoic units along the strike of the Appalachian Mountains are presented in columnar sections and descriptions. The general agreement in all areas is mentioned; then variations in the sequences are listed. The Blount group variation (Ordovician) is a notable example. It is due to differential erosion and deposition within the geosyncline during the Paleozoic.
16. (and Moore, Elwood S.). Geology and mineral resources of the Bellefonte quadrangle [Centre County], Pennsylvania: U. S. Geol. Survey, Bull. 855, v, 111 p., illus. incl. geol. map, 1936. A complete geologic description of the area is given. Cambrian-Pennsylvanian, and Quaternary rocks are mapped. The area is at the Allegheny Front where faults and folds are present. Sections are measured; fossils are listed. Iron ore, limestone, stone, lead, zinc, silver, barite, fluorite, and clay are the mineral resources.
17. The Brailler shale and Chemung formation of central Pennsylvania and Virginia and their bearing on the Portage-Chemung question [abs.]: Va. Acad. Sci., Proc. 1935-36, p. 67-68, 1936.
18. (and Swartz, Frank McKim, and Willard, Bradford). Geology and mineral resources, Tyrone quadrangle [Blair, Centre, and Huntingdon Counties]: Pa. Geol. Survey 4th ser., Topog. Geol. Atlas 96, v, 118 p., illus. incl. geol. map, 1939. A complete geologic description of the area is given. Cambrian-Mississippian rocks are present. Sections are measured; fossils are listed. Iron, lead, zinc, barite, stone, ganister, clay, sand and gravel, and limestone are the mineral resources described.
19. The Appalachian Plateau and Mississippi Valley, *in* Geology of North America 1 by R. Ruedemann and R. Balk, [part] *of* Geologie der Erde, ed. by

E. Krenkel: p. 312-462, illus., Borntraeger, Berlin, 1939. A complete stratigraphic discussion of the area includes the Commonwealth. Devonian-Permian rocks are described.

20. Description of the Hollidaysburg and Huntingdon quadrangles [Blair, Bedford, and Huntingdon Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 227, 27 p., illus. incl. geol. maps, 1945. A complete geologic description of the area is given. Cambrian-Pennsylvanian rocks are mapped. The structure consists of folds and faults. Sections are measured; fossils are lited. Limestone, stone, iron ore, coal, clay, shale, and sand are the mineral resources described.

BUWALDA, JOHN PETER

1. Even-crested ridges as evidences of former peneplanation [abs.]: Geol. Soc. Amer., Bull. 35, p. 167, 1924.

BYE, DORIES L.

1. *"Cyrtospirifer disjunctus"* species in Pennsylvania and southwestern N. Y.: M.S. thesis, Penn. State College, 1949.

CADDELL, HENRY M.

1. A visit to the coal, oil, and anthracite districts of Pennsylvania, August, 1891: Mining Inst. Scotland, Trans. 13, p. 242-267, illus., Hamilton, 1891. This is a review of the geology of the Commonwealth with emphasis on mining and production techniques. Cross sections are included.

CALLAGHAN, WILLIAM H.

1. (and Newhouse, Walter Harry). A study of the magnetite ore body at Cornwall [Lebanon County], Pa.: M.S. thesis, Mass. Inst. Tech., 1927; Economic Geology 24, p. 403-411, illus., 1929. Contact metamorphic minerals are zonally arranged relative to the diabase dike. The ore seems to have preferably replaced shaly limestone. The sulphides are later than the oxides and the magnetite later than part of the silicates. The zonation suggests that the solutions came from the diabase.

CALLEN, ALFRED C. See Stoddard, Jesse C., 1.

CAMERON, N. S.

1. (and Hunt, E.). Lower and Middle Devonian formations near Everett, Bedford County, Penna.: S.P. thesis, Bryn Mawr College, 1941.

CAMPBELL, MARIUS ROBINSON. See also Ashley, George Hall, 10; White, Charles David, 5.

1. Description of the Masontown and Uniontown quadrangles [Fayette, Greene, and Washington Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 82, 21 p., illus. incl. geol. maps, 1902. A complete geologic description of the area is given. Devonian-Permian, and Pleistocene rocks are mapped. Anticlines and synclines make up the major structure. The physiography is important. Sections are measured. Coal, gas, and oil are the major economic products; clay, stone, and iron ore are also present.
2. [and Fuller, Myron Leslie]. Description of the Brownsville and Connellsville quadrangles [Allegheny, Fayette, Washington, and Westmoreland Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 94, 19 p., illus. incl. geol. maps, 1903. A complete geologic description of the area is given. [Mississippian]-Permian, and Pleistocene rocks are mapped. Coal and gas are the chief resources. Stone, sand, and limestone are also discussed.
3. Geographic development of northern Pennsylvania and southern New York: Geol. Soc. Amer., Bull. 14, p. 277-296, illus., 1903. Two peneplain remnants, the Somerville and Harrisburg, are evident. They are provisionally dated Tertiary, as the [Schooley peneplain] is Cretaceous and these two are lower. The Somerville surface is the lower of the two; the Harrisburg is the upper. They are traced throughout Pennsylvania after being recognized in the north. The warping due to uplift is demonstrated.
4. Pocono rocks in the Allegheny Valley [Armstrong County] [abs.]: Science ns 17, p. 942, 1903.
5. Recent work in the bituminous coal field of Pennsylvania: U. S. Geol. Survey, Bull. 213, p. 270-275, 1903. A detailed progress report, in which the coal stratigraphy of the western counties is described. Some new oil and gas pools are described also. The structure is outlined.

6. Description of the Latrobe quadrangle [Indiana-Westmoreland Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 110, 15 p., illus. incl. geol. maps, 1904. A complete geologic description of the area is given. [Mississippian]-Permian (?), and Pleistocene rocks are mapped. The structure is gentle folds. Coal, gas, stone, sand, clay, limestone, and salt are the mineral resources described.
7. [Map of] Coal fields of the United States: Scale, 1:7,000,000, incl. text, U. S. Geol. Survey, 1907; also 1908 ed.; also 1926 ed. without text, *in* Internatl. Conf. on Bituminous Coal, Carnegie Tech, Pittsburgh, 1926.
8. (and Clapp, Frederick Gardner, and Butts, Charles). Description of the Barnesboro and Patton quadrangles [Cambria, Indiana, Clearfield, and Blair Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 189, 13 p., illus. incl. geol. maps, 1913. A complete geologic description of the area is given. Mississippian-Pennsylvanian rocks are mapped. The structure is gentle folds. Coal, gas, clay, sandstone, and limestone are the mineral resources described.
9. Analyses of coal samples from various fields in the United States: U. S. Geol. Survey, Bull. 541, p. 491-526, 1914. Many analyses of coals in the western counties of the Commonwealth are included along with some from other states.
10. (and Clark, Frank R.). Analyses of coal samples from various parts of the United States: U. S. Geol. Survey, Bull. 621, p. 251-370, 1916. Sixteen coal analyses from Somerset County are included among many others.
11. Coal fields of the United States considered as sources of supply for the western hemisphere: Pan-American Sci. Cong., 2nd, Washington, Proc. sec. 7, vol. 8, p. 163-174, 1917. A very brief description of the coal fields of the Commonwealth is included. It deals mostly with production statistics.
12. The coal fields of the United States—general introduction: U. S. Geol. Survey, Prof. Paper 100, 33 p., illus. geol. map, 1917; revised 1922; revised 1929 [1930]. A generalized description of the coal fields of the United States including the Commonwealth is given. A map is included, as are analyses.
13. Our coal supply—its quantity, quality, and distribution: Internatl. Conf. on Bituminous Coal [1st], Pittsburgh, Nov. 15-18, p. 18-28, 1926. A generalized discussion of the coal fields of the United States, including Pennsylvania is given. Analyses are included.
14. Late geologic deformation of the Appalachian Piedmont as determined by river gravels: Natl. Acad. Sci., Proc. 15, p. 156-161, illus., 1929; discussion with title, Is the Bryn Mawr peneplain a warped surface? by G. W. Stose: Amer. Jour. Sci. 5th ser. 19, p. 177-184, illus., 1930. Gravels in the southeastern counties are studied and a large warping of the old peneplain surface is inferred. Stose says the gravels are miscorrelated and that the various surfaces are not warped.
15. The anthracite field of Pennsylvania, *in* Mineral deposits of New Jersey and eastern Pennsylvania, by C. P. Berkey: Internatl. Geol. Cong., 16th, U. S. 1933, Guidebook 8, Excursion A-8, p. 41-44, 1932. A generalized description of the area, its faunal relations, structure, and metamorphism, regional and local, is given.
16. Chambersburg (Harrisburg) peneplain in the Piedmont of Maryland and Pennsylvania: Geol. Soc. Amer., Bull. 44, p. 553-573, illus., 1933. The Harrisburg peneplain is better exposed near Chambersburg, hence the name-change. River-gravel deposits on large-stream berms are an important clue to tracing the surface. Based on estimates of volumes of material removed, its age is Miocene. It was warped into the Westminster anticline.
17. (and Bascom, Florence). Origin and structure of the Pensauken gravel: Amer. Jour. Sci. 5th ser. 26, p. 300-318, illus., 1933. This gravel, in the Delaware River valley and northward, was deposited as alluvial-fan material in a confining valley, giving it a down-warped appearance. It is pre-Wisconsin in age. Material which came from eastern Pennsylvania and was deposited by Delaware and Hudson Rivers, was combined in old courses which joined in northern Pennsylvania.

CARDEZA, J. T. M. See also Rand, Theodore Dehon, 21.

1. Fossil (?) casts in sandstone [Chester County]: Acad. Nat. Sci. Phila., Proc.

[32] 1880, p. 280, 1881. Long, oblong, rounded casts in Lower Cambrian sandstone from Dutton's Mills are reported. They are not necessarily fossil.

2. Garnet mistaken for corundum: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 295, 1881; discussion with title, The so-called emery-ore from Chelsea, Bethel Township, Delaware County, Pennsylvania, by F. A. Genth, p. 311; Mineralogy and Geol. Sec., Proc. no. 1, p. 75, 1881. A garnet rock, mined and sold as corundum, is analyzed and proven to be an ordinary iron-alumina garnet.

CARENDEFFEZ, BARON

1. Mineralogical discoveries [Chester County]: Medical Repository 2nd [ser.] 5, p. 96, 1808. [Molybdenite] is reported from the county. No details are included.

CARLL, JOHN FRANKLIN, 1828-1904.

1. Report of progress in the Venango [Venango County] oil district: Pa. Geol. Survey 2nd, I, p. 1-49, illus., 1875. The genesis, source, and occurrence of petroleum in the area are described. Oil sands are in the [Mississippian] and [Devonian] rocks. Generalized stratigraphic sections are given.
2. Oil well records and levels [western Pa.]: Pa. Geol. Survey 2nd, II, xiv, 398 p., 1877. Well logs, detailed and general, in the north tier and west tier of counties are given. In most, depths to various marking horizons are included; the balance are detailed lithologic records. The results of the drilling are cited.
3. The geology of the oil regions of Warren, Venango, Clarion, and Butler Counties, including surveys of the Garland and Panama conglomerates in Warren and Crawford . . . cos., . . . and a discussion of the preglacial and postglacial drainage of the Lake Erie country: Pa. Geol. Survey 2nd, III, xxxiv, 482 p., illus. incl. atlas, 1880. Detailed stratigraphy and well-correlation of [Devonian] and [Mississippian] rocks are given. Sections are measured; fossils are listed. Most of the petroleum comes from the [Devonian] Venango sand group. Its structure and texture are discussed. Descriptions of subsurface formations are given. Physiographic studies reveal that the preglacial streams of the area flowed northward and were changed southward to the Allegheny basin by glacial scouring and by debris.
4. Geological report on Warren County, and the neighboring oil regions with additional oil well records: Pa. Geol. Survey 2nd, I4, xxi, 439 p., illus. incl. geol. maps, 1883. Well logs are listed, as is the complete geologic description of the county. [Devonian]-[Pennsylvanian] rocks are exposed. Sections are measured; analyses are made, and fossils are listed. Building stone, clay, and petroleum are the chief resources. The petroleum is from [Devonian] rocks, and correlations are made.
5. Preliminary report on oil and gas [western Pa.]: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 1-81, illus., 1886. A correlation of the oil-bearing sandstones from McKean to Greene Counties is presented. [Devonian]-[Pennsylvanian] beds are involved. A survey of production and a prediction of the future for various districts are presented. Gas-oil relations are discussed.
6. Natural gas in Pennsylvania: Amer. Manufacturer and Iron World, Natural Gas Supl. no. 2, p. 5, 17, illus., 1887. This is a review of the occurrence of gas in the [Devonian]-[Mississippian] rocks of western Pennsylvania. No new data are included.
7. Report on the oil and gas regions: Pa. Geol. Survey 2nd, Ann. Rpt. 1886, pt. 2, p. 575-786, illus. incl. geol. maps [by C. A. Ashburner and E. V. D'Invilliers], 1887. An exhaustive discussion of the oil and gas regions of the western part of the Commonwealth is given. [Devonian] and [Mississippian] strata are the important producers. Sections are measured; correlations are made.
8. Oil region [rock] collections, *in* Catalogue of the geological museum, Part 3: Pa. Geol. Survey 2nd, 000, p. 33-92, 1889. Catalogued samples of rock and oil reported in the various oil-region reports are listed.
9. Seventh report on the oil and gas fields of western Pennsylvania: Pa. Geol. Survey 2nd, I5, viii, 356 p., illus. incl. geol. map, 1890. Description of the formations from Helderberg limestone to the Pottsville conglomerate, and their relations to the oil fields are given. Correlations are made; sections are measured, and fossils are listed. Well logs are given, mostly from the [Devonian].

CARLSTON, CHARLES WILLIAM

1. Appalachian drainage and the highland border sediments of the Newark series. Ph.D. thesis, Columbia Univ., 1946; Geol. Soc. Amer., Bull. 57, p. 997-1031, illus. incl. geol. map, 1946. The fanglomerates of the Triassic show no relation to present-day drainage. There is no evidence of large streams having been present during the Triassic. The streams were relatively short and steep. The fanglomerate lithology varies, as did the source.

CARPENTER, FRANK MORTON

1. Carboniferous insects from Pennsylvania in the Carnegie Museum and the Museum of Comparative Zoology: Carnegie Museum, Annals 22, p. 323-341, illus., 1934. Twelve genera and fourteen species are described from Schuylkill, Jefferson, and Allegheny Counties. All are Pennsylvanian.

CARPENTER, GEORGE W.

1. Miscellaneous localities of minerals [Philadelphia County]: Amer. Jour. Sci. 8, p. 236. 1824; 9, p. 45, 1825. White beryl, radiated steatite, manganese garnet, actinolite, schorl, limpid quartz, [chromite], mica, staurotide, zircon, and [apatite] are mentioned as being found from various localities in the county. Little data of the minerals are included.
2. (and Spackman, George). Miscellaneous localities of minerals [Chester County]: Amer. Jour. Sci. 9, p. 245-246, 1825; 10, p. 218-223, 1826. [Calcite] as veins in limestone quarries near Downingtown is mentioned. [Apatite] is reported from near Philadelphia as is kyanite and asbestoid actinolite. Eighty-seven other minerals are listed also.
3. On the mineralogy of Chester Co., with an account of some of the minerals of Delaware, Maryland, and other localities: Amer. Jour. Sci. 14, p. 1-14, 1828. A township-by-township list of a variety of minerals is given. Locations are given, but there are very little data about the minerals. Bucks and Philadelphia Counties are included also.

CARTER, OSCAR C. S.

1. Ores, minerals, and geology of Montgomery Co., *in* History of Montgomery County, ed. by T. W. Bean: p. 8-33, illus. incl. geol. map, Everts and Peck, Philadelphia, 1884. Gold, silver, copper, iron, graphite, and lignite are listed and described from the county. Stone, quartz, clay, kaolin, limestone, and serpentine are also described. The various rocks are described, but with little or no attempt at interpretation.
2. Artesian wells [at various localities]: Amer. Phil. Soc., Proc. 29, p. 43-49, 1891. Logs of water wells are given. They are (1) in Montgomery County in the Triassic rocks at Norristown, Washington Square, Worcester Township, in the [Ordovician] limestone, in the [Cambrian] quartzite, and in the [Ordovician] clay, and (2) in mica schist in Philadelphia County, and Radnor, Delaware County.
3. Feldspar bed in Laurentian (?) gneiss [Montgomery County]: Amer. Phil. Soc., Proc. 29, p. 49-50, 1891. An orthoclase feldspar dike in gneiss is described. The dike is 45 feet thick; some quartz is present.
4. Artesian wells: Franklin Inst., Jour. 136, p. 230-239, 298-305, 1893. This is a generalized discussion of water wells with examples drawn from the southeastern counties. Rock types are discussed extensively.
5. Artesian wells as a water supply for Philadelphia [Philadelphia County]: Franklin Inst., Jour. 135, p. 58-61, 1893. Water wells are recommended as sources of water after an extensive drought. Well characteristics of the area are discussed.
6. Anthracite coal near Perkiomen Creek [Montgomery County]: Franklin Inst., Jour. 138, p. 152-156, 1894. A 26-inch seam of Triassic coal is described. Its location is given in detail. Other smaller seams nearby are described. Its analysis suggests bituminous coal.
7. Drilling for oil and natural gas in the vicinity of Philadelphia: Franklin Inst., Jour. 138, p. 230-236, 1894. A review of petroleum and gas characteristics is given, with a reminder of the futility of drilling in southeast Pennsylvania; some apparently have tried.
8. A ferruginised tree [Montgomery County]: Franklin Inst., Jour. 141, p. 227-229, 1896. A tree fragment replaced by limonite is described from Triassic rocks. Some is still carbonized and shows the woody texture.

CASE, ERMINE COWLES

1. Description of vertebrate fossils from the vicinity of Pittsburgh, [Allegheny County] Pa.: Carnegie Museum, Annals 4, p. 234-241, illus., 1908. Amphibian and reptilian fragments are illustrated and described from the "Pittsburgh red shale" just below the Ames limestone in the Conemaugh Formation.
2. Permo-Carboniferous conditions versus Permo-Carboniferous time: Jour. Geology 26, p. 500-506, 1918. The Dunkard rocks in southwestern Pennsylvania are included in a general discussion of Permo-Carboniferous depositional conditions. Time-transgressing facies are recognized by the vertebrate fossil fauna, and the Dunkard group in the Commonwealth may not be true Permian as previously suspected. The environment controlled the fauna which is not necessarily time-parallel.
3. The environment of life in the late Paleozoic in North America—a paleogeographic study: Carnegie Inst. Washington, Pub. 283, 273 p., illus., 1919. A monograph includes a discussion of the red Pennsylvanian and Permian beds of southwestern Pennsylvania. The ancient climate is inferred from the rocks and fossils.

CASTER, KENNETH EDWARD. See also Flower, Rousseau Hayner, 1.

1. Higher fossil faunas of the upper Allegheny [northwestern Pa.]: Bull. Amer. Paleontology 15, no. 58, 316 p., illus., 1930. Detailed descriptions of the fauna of the Upper Devonian and Lower Carboniferous rocks are given. Brachiopods, pelecypods, gastropods, cephalopods, sponges, arthropods, fish, and amphibians are discussed.
2. Pre-Pennsylvanian stratigraphy of northwestern Pennsylvania: Ph.D. thesis, Cornell Univ., 1933.
3. Stratigraphic relationships in northwestern Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 44, p. 202-203, 1933.
4. Facies nomenclature and the Upper Devonian [abs.]: Geol. Soc. Amer., Proc. 1933, p. 348-349, 1934.
5. The stratigraphy and paleontology of northwestern Pennsylvania—Part 1, Stratigraphy: Bull. Amer. Paleontology 21, no. 71, 185 p., illus., 1934; discussion by G. H. Chadwick: Geol. Soc. Amer., Bull. 46, p. 340-341, 1935. The Upper Devonian and Mississippian rocks are described. Sections are measured; correlations are made. The facies concept is important in this work. The Catskill delta rocks are reconsidered in the light of facies concepts which are new. The faunas are listed.
6. Boundary between Devonian and Mississippian systems in western Pennsylvania [abs.]: Geol. Soc. Amer., Proc. 1934, p. 441-442, 1935.
7. Demise of "Bradfordian series" [northwest Pa.]: Amer. Assoc. Petroleum Geologists, Bull. 19, p. 912-914, 1935; discussion by P. D. Torrey and G. H. Chadwick, p. 915, 1935; discussion with title, Age of Devonian of southwestern Pennsylvania, by B. Willard, p. 1546-1547; reply by author, p. 1547-1550; reply by B. Willard, p. 1550, 1935. The Bradfordian series, a Devonian-Mississippian group is no longer needed. An unconformity occurs within it; the lower part is Devonian and the upper part is Mississippian. The Mississippian beds could be called Oil Lake group and the Devonian beds the Conewango group. Fossils are listed to support the concept.
8. Upper Devonian marine faunas in the seaward phase of the Catskill magnafacies [abs.]: Geol. Soc. Amer., Proc. 1934, p. 363, 1935.
9. A restudy of the tracks of *Paramphibius* [Susquehanna County]: Jour. Paleontology 12, p. 3-60, illus., 1938. *Paramphibius* tracks were made by a crustacean, not an amphibian. Other closely related limulids are discussed. The rocks are marine. There are, therefore, no amphibians in the Devonian rocks of the U. S. Willard (1935) originally discussed this form and called it the first amphibian in the U. S. Devonian.
10. Some facieological aspects of the pelecypod fauna of the Conewango series of the Upper Devonian in New York and Pennsylvania [abs.]: Geol. Soc. Amer., Proc. 1937, p. 271-272, 1938.
11. Siliceous sponges from the Mississippian and Devonian strata of the Penn-York embayment [western Pa.]: Jour. Paleontology 13, p. 1-20, illus., 1939; addition with title, Comparison of the siliceous sponges *Armstrongia* Clark,

1920, and *Titusvillia* Caster, 1939, p. 531-532, 1939. Three genera and five species of glass sponges are described. Most are new. They are from the same environmental facies as hitherto described siliceous sponges.

12. Some biological considerations in interpreting the stratigraphy of the Penn-York embayment [western Pa.] [abs.]: Geol. Soc. Amer., Bull. 50, p. 1976-1977, 1939.

CASWELL, ALEXIS

1. Memoir of Benjamin Silliman, 1799-1864: Natl. Acad. Sci., Biog. Mem. 1, p. 99-112, 1877.

CATHCART, STANLEY HOLMAN. See also Ashley, George Hall, 49; Fettke, Charles Reinhard, 12, 13.

1. Origin of concretions in certain shales of the Bellefonte quadrangle [Centre County]: M.S. thesis, Penn. State College, 1916.
2. Northern Pennsylvania's gas area [Tioga County]: Oil and Gas Jour. 29, no. 44, p. 53, 56, illus., 1931. A review of the Devonian gas-producing formations in the county is given. No new details are included.
3. Status of drilling, with notes on geology, *in* Gas in the Tioga region [Tioga County] Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 102, p. 1-8 (#), 1931. Oriskany sandstone production is described on the Sabinsville anticline. Well logs show the Devonian section, although surface exposures are poor and difficult to interpret.
4. Gas in the Oriskany sand of Potter County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 105, 7 p. (#), illus., 1932. Gas comes from the Oriskany sandstone on the Hebron anticline. The structure is faulted also.
5. Gas and oil in Potter Co., Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 106, 31 p. (#), illus., 1934. Devonian-Pennsylvanian rocks at the surface are described. Well log descriptions are given of the Devonian rocks. The structure (anticlines) is described. The Oriskany sandstone is the big producer.
6. (and Myers, Thurman H.). Gas in Tioga County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 107, 42 p. (#), illus., 1934. Devonian-Pennsylvanian surface rocks are described. The Silurian-Devonian rocks are described from well logs. The structure (anticlines) is described. The Oriskany sandstone is the big producer.
7. Geologic structure in the plateaus region of northern Pennsylvania and its relation to the occurrence of gas in the Oriskany sand: Pa. Topog. Geol. Survey [4th ser.], Bull. 108, 24 p. (#), illus., 1934. Various structures are described and related to one another. Stratigraphic lenses are common traps, and petroleum and gas in some areas are unrelated to structure in the "shallow" [post-Oriskany sandstone] sands. There is a relation to structure in the Oriskany sandstone. Cross folding and block faulting are described.
8. Possibility of finding gas in the Oriskany sand in McKean County: Pa. Topog. Geol. Survey [4th ser.], Bull. 111, 13 p. (#), illus., 1934. Devonian-Pennsylvanian surface rocks are described. Silurian-Devonian rocks are mentioned from well logs. "Shallow" production comes from post-Oriskany sandstones. The Oriskany sandstone seems to be irregularly distributed. The structure (anticlines) is outlined.
9. The possible occurrence of gas in the Oriskany sand of Elk County: Pa. Topog. Geol. Survey [4th ser.], Bull. 110, 21 p. (#), illus., 1934. Devonian-Pennsylvanian surface rocks are described. Distances to the Oriskany sandstone are calculated. The structure (anticlines) is outlined. Production comes from "shallow" sands [post-Oriskany]. The Oriskany sandstone is not recognized.
10. The possibility of finding gas in Cameron County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 109, 16 p. (#), illus., 1934. Devonian-Pennsylvanian surface rocks are described, and sections are measured. Various depths to the Oriskany sandstone are calculated. The structure (anticlines) is described. Gas is not likely to occur in large quantities.
11. Deep sand development in the eastern area—Geology: Drilling and Production Practice 1934, p. 108-115, illus., Amer. Petroleum Inst., 1935; discussions p. 115-116. The geology of Oriskany sand development in Pennsylvania is briefly summarized. Silurian and Ordovician sand possibilities are considered. Structure maps are included.

12. Supplementary record of "deep sand" wells in Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 117, 27 p. (#), illus., 1937. A supplement to Bulletins 106-108. Oil field extension in the Oriskany sandstone is described. The subsurface structure is outlined. Generalized well records are included.
13. (and Sherrill, Richard Ellis, and Matteson, L. S.). Geology of the oil and gas fields of the Tidioute quadrangle, [Warren-Forest Counties], Pennsylvania (advance report): Pa. Topog. Geol. Survey [4th ser.], Bull. 118, 14 p. (#), illus., 1938. Devonian-Pennsylvanian surface rocks are described. Details of subsurface Devonian rocks are given, discussing various "sands" and traps. Correlations are suggested; well logs are given.
14. Pennsylvania, *in* Partial list of geological publications pertinent to the oil and gas industry: Appalachian Geol. Soc., Bull. 1, p. 459-463, 1949. A bibliography of the serial publications issued by the Commonwealth and by the U. S. Geological Survey is given.

CATHER, MARGARET ELAINE. See Rittenhouse, Gordon, 2.

CATLETT, C. See Chance, Henry Martyn, 18.

CHADWICK, GEORGE HALCOTT. See also Ashley, George Hall, 56; Caster, Kenneth Edward, 5, 7; Swartz, Charles Kephart, 3.

1. *Bothriolepis* slab from [Bradford County] northeastern Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 42, p. 361, 1931.
2. Catskill formation [abs.]: Geol. Soc. Amer., Bull. 42, p. 242-243, 1931; Pan-Amer. Geologist 55, p. 310, 1931.
3. Medina of Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 43, p. 272, 1932, Pan-Amer. Geologist 57, p. 152, 1932.
4. Pocono problem [northern Pennsylvania] [abs.]: Geol. Soc. Amer., Bull. 43, p. 273, 1932; Pan-Amer. Geologist 57, p. 153, 1932.
5. Great Catskill delta, and revision of late Devonic succession: Pan-Amer. Geologist 60, p. 91-107, illus., 1933; [Part] 2, Areal refinements, p. 189-204, illus., 1933; [Part] 3, Revised correlations, p. 275-286, 348-360, illus., 1933; discussion with title, The age of the Pocono by C. D. White: Amer. Jour. Sci. 5th ser. 27, p. 265-272, 1934; reply by author with title, What is "Pocono"? 29, p. 133-143, illus., 1935. The Devonian formations are described and discussed in detail. The facies relationships between the Catskill, Chemung, Portage, Genesee, and Pocono (which is considered Devonian) Formations are shown. White says the flora and fauna of the Pocono Formation are Mississippian, and the author claims that the definition of the Pocono rocks is not certain.
6. Faunal differentiation in the Upper Devonian: Geol. Soc. Amer., Bull. 46, p. 305-341, illus., 1935; discussion by B. Willard, p. 2017; reply by author, p. 2018, 1935. Faunal lists of the various groups are given. Those faunas which are characteristic are separated from those which are not. The rocks are: (1) Genesee group, (2) Naples group, (3) Chemung group, (4) Canadaway group, (5) Conneaut group, and (6) Conewango group. The upper boundary of the Devonian System is discussed.
7. Summary of Upper Devonian stratigraphy: Amer. Midland Naturalist 16, p. 857-862, illus., 1935. The Commonwealth is mentioned in a review of the Devonian stratigraphic units found in New York.

CHAFFEE, ROBERT GIBSON. See Colbert, Edwin Harris, 1.

CHAMBERLIN, BENJAMIN B., 1831-1888.

1. Notes on minerals from the French Creek mines, Chester Co., Penn. [abs.]: New York Acad. Sci., Trans. 4, p. 41-42, 1887.

CHAMBERLIN, DALE S.

1. Study of the formation of dolomite in Beekmantown limestown: M.S. thesis, Lehigh Univ., 1920.

CHAMBERLIN, ROLLIN THOMAS

1. The Appalachian folds of central Pennsylvania: Jour. Geology 18, p. 228-251, illus., 1910. Field observations and laboratory experiments are made on the folds from Harrisburg to Tyrone. Dips were measured and attempts made to (1) determine crustal shortening, and (2) determine the original height of the mountains. The shortening was about 15 miles, or 81 miles compressed to 66 miles. The average height of the Pottsville Formation was 2.8 miles.
2. Memorial of Rollin D. Salisbury, [1858-1922]: Geol. Soc. Amer., Bull. 42, p. 126-138, port., 1931.

CHAMBERLIN, THOMAS CHROWDER, 1843-1928.

1. Introduction, *in* The glacial boundary in Pennsylvania . . ., by G. F. Wright: U. S. Geol. Survey, Bull. 58, p. 13-38, 1890. Besides general glacial discussion, the terraces of the western counties are described and explained. (1) The high terrace is horizontal, but is above the Cincinnati ice dam; (2) the high-pebble-terraces are fluviatile and contemporaneous with early glaciation; (3) the lower terraces are directly related to [Wisconsin] ice, and (4) the slender, horizontal terraces are the result of the Cincinnati ice dam.
2. Some additional evidences bearing on the interval between the glacial epochs: Geol. Soc. Amer., Bull. 1, p. 469-474, 1890; discussion, p. 474-480. Incised terraces and abandoned glacial-filled channels in the Allegheny, Susquehanna, and Delaware Rivers are used, along with evidence from elsewhere, as proof of multiple glaciation.
3. The attitude of the eastern and central portions of the United States during the glacial period: Amer. Geologist 8, p. 267-275, 1891; abstract with discussion by W. Upham: p. 233, 1891; Amer. Assoc. Adv. Sci., Proc. 40, p. 250, 1892. The glacial deposits of the Commonwealth are included in the description, and the conclusions are reached that the land sloped differently at different times during the ice invasions.
4. [Glacial succession in the United States] [abs.]: Amer. Geologist 12, p. 227-228, 1893.
5. (and Leverett, Frank). Further studies of the drainage features of the upper Ohio basin [western Pa.]: Amer. Jour. Sci. 3rd ser. 47, p. 247-283, illus., 1894; correction, p. 483. The physiographic features relating to the northward-flowing streams are described. Probable old drainage basins, old fluvial floors, the glacial drift, and terraces are described. Simple glacial-fluvial action alone is responsible for the reversal. Several stages of deposition and excavation are indicated. Four hypotheses which are alike in general are presented but which differ somewhat in details. No single one will explain all the facts.
6. Map of North America during the ice age: Scale, 1 inch equals 104 miles, Rand McNally, Chicago, 1913.

CHANCE, HENRY MARTYN. See also White, Israel Charles, 13.

1. A measured section of the Paleozoic rocks between Lock Haven and Farrandesville in Clinton Co., Pa.: Pa. Geol. Survey 2nd, F, p. 265-269, 1878. A very detailed measured section from the [Cambrian] to the [Pennsylvanian] is given.
2. Hyner's Station oil well section . . . in the vicinity of Renovo, Clinton Co., Pennsylvania: Amer. Phil. Soc., Proc. 17, p. 670-672, 1878. Oil well records are used to describe a section from the Allegheny Formation down to the Chemung Formation. Over 3400 feet of rocks are described, some in detail.
3. A special survey made in 1875 along the Beaver and Shenango Rivers in Beaver, Lawrence, and Mercer Counties: Pa. Geol. Survey 2nd, V, p. 185-228, illus., 1879. The Mercer group, Pennsylvanian, is traced along by outcrop in order to determine the position of the Sharon coal bed in relation to the Allegheny group. Detailed sections are measured. The Pottsville conglomerate and Berea grit are also studied in detail to determine their correlations to rocks in other parts of the Commonwealth.
4. The northern townships of Butler County: Pa. Geol. Survey 2nd, V, p. xvii, 1-183, illus. incl. geol. map, 1879. A complete geologic description of the area is given. [Pennsylvanian] and [Pleistocene] rocks are present. The structure is discussed in detail. Sections are measured; fossils are listed. Coal and petroleum are the chief resources. Subsurface correlations are made.
5. A special survey of the Sub-carboniferous, from the Allegheny Mountains [Clinton County] to the Clarion-Venango oil district along the Susquehanna: Pa. Geol. Survey 2nd, G4, p. 79-152, illus., 1880. Many sections are measured to show that the Mauch Chunk and Catskill Formations thin westward, but the Pocono Formation, between them, continues to Ohio. The oil sands are, therefore, in the lower Pocono-equivalent which is equivalent to the Chemung Formation in age. A discussion of the depositional circumstances is presented.
6. The geology of Clarion Co.: Pa. Geol. Survey 2nd, VV, xv, 232 p., illus. incl. geol. map, 1880. A complete geologic description of the area is given.

[Mississippian]-[Pennsylvanian] rocks are present. [Pleistocene] features are described. The structure is detailed. Sections are measured; fossils are listed. Coal and oil are the chief resources.

7. The geology of Clinton County: Pa. Geol. Survey 2nd, G4, p. xiv, 1-72, illus. incl. geol. map, 1880. A complete geologic description of the area is given. [Ordovician]-[Pennsylvanian] rocks are present. Sections are measured; fossils are listed. Coal and iron ore are the chief mineral resources.
8. The Millstone grit in England and Pennsylvania: Amer. Jour. Sci. 3rd ser. 21, p. 134-135, 1881. The Pottsville Formation of western Pennsylvania is composed of conglomerate, sandstone, shale, and coal. The Millstone grit, or basal [Pennsylvanian] of England has a similar sequence.
9. A survey of the Schuylkill water gap in the counties of Schuylkill and Berks: Pa. Geol. Survey 2nd. G6, p. 334, and pocket plate, 1882. A topographic map and a cross section of the gap is given. It is a syncline which has been faulted on the south. [Ordovician]-[Devonian] rocks are present.
10. Special survey of the Delaware water gap [Northampton-Monroe Counties]: Pa. Geol. Survey 2nd, G6, p. 334-348, illus., 1882. A topographic map and structural cross sections are presented. [Ordovician]-[Devonian] rocks are involved and are described in detail. The structure is a large syncline limb which has been extensively faulted.
11. Special survey of the Lehigh water gap [Carbon County]: Pa. Geol. Survey 2nd, G6, p. 349-363, illus., 1882. A description of the water gap is given. Rocks from [Silurian] to [Devonian] age are described. It is primarily a faulted, overturned south limb of a syncline. A section is measured.
12. The available tonnage of the bituminous coal fields of Pennsylvania: Amer. Inst. Mining Engineers, Trans. 10, p. 144-162, 1882. Estimates of reserves for each county are calculated and listed, along with a brief resumé of the stratigraphy of the coal-bearing beds.
13. The slate quarries in 1875, with four cross sections, *in* The Geology of Lehigh and Northampton Counties, by J. P. Lesley: Pa. Geol. Survey 2nd, D3, pt. 1, p. 148-160, illus., 1883. The [Martinsburg] Formation is described at Delaware Gap, Lehigh Gap, and Schuylkill Gap. The emphasis is on the slate-bearing portion.
14. A revision of the bituminous coal measures of Clearfield Co.: Pa. Geol. Survey 2nd, H7, xv, 197 p., illus. incl. geol. maps, 1884. A detailed description of the area is given. [Mississippian]-[Pennsylvanian] rocks are mapped. The structure consists of gentle folds. Much detail of the coal-bearing rocks is given. Limestone, iron ore, and fire clay are also discussed.
15. The anticlinal theory of natural gas: Amer. Inst. Mining Engineers, Trans. 15, p. 3-13, 1887; Petroleum Age 5, p. 1309-1312, 1886. A general discussion of the theory includes examples drawn from the Commonwealth.
16. Report on coal lands of Merrian and Munson, near Westport, Clinton County, Penn'a.: 14 p., illus., [priv. pub.] [Philadelphia?] [1890]. The Brookville-Lower Freeport coal beds are considered from reserve point of view. Sections are measured.
17. A biographical notice of J. Peter Lesley [1819-1903]: Amer. Phil. Soc., Proc. 45, p. i-xiv, 1906.
18. A new theory of the genesis of brown hematite ores—and a new source of sulphur supply: Amer. Inst. Mining Engineers, Bull. 23, p. 791-808, illus., 1908; Trans. 39, p. 522-539, illus., 1909; discussion by C. Catlett, Bull. 24, p. 1179-1183, 1908; Trans. 39, p. 916-920, 1908. Evidence is presented to show that the limonite along the contact of the [Paleozoic] and [Precambrian] rocks are gossans of oxidized pyrite bodies. Examples are drawn from the Commonwealth. The pyrite-bearing beds are interstratified in the [Cambrian] schist. The pyrite, deeper down, could be used as a source of sulphur.
19. (and Chance, T. M.). Low-sulphur coal in Pennsylvania: Amer. Inst. Mining and Metallurgical Engineers, Bull. 152, p. 1459-1468, 1919; Trans. 63, p. 649-658, 1920; discussion by R. R. Hice, p. 658-659, 1920. Coal with less than one percent is low-sulphur coal. The percentages are irregularly distributed in the Commonwealth, and no geographic limits can be defined. Individual areas and formations are discussed.

CHANCE, T. M. See Chance, Henry Martyn, 19.

CHAPMAN, HENRY C.

1. Memoir of Joseph Leidy, M.D., LL.D., [1823-1891]: Acad. Nat. Sci. Phila., Proc. [51] 1891, p. 342-388, 1891.
2. The life and work of Joseph Leidy [1823-1891]: Science ns 26, p. 812-814, 1907.

CHAPMAN, RANDOLPH. See Cloos, Ernst, 8.

CHEDSEY, W. R. See Torrey, Paul Dwight, 1.

CHELIKOWSKY, JOSEPH RUDOLPH

1. Geologic distribution of fire clays in the United States: Ph.D. thesis, Cornell Univ., 1935; Amer. Ceramic Soc., Jour. 18, p. 367-390, 1935. A review, by state, of occurrences in the country includes a brief listing of geological horizons which bear fire clay in the Commonwealth. All are associated with the coal formations.

CHENEY, MONROE GEORGE

1. (and others). Classification of Mississippian and Pennsylvanian rocks of North America: Amer. Assoc. Petroleum Geologists, Bull. 29, p. 125-169, illus., 1945. A detailed discussion of the problems and suggested remedies are given. The Commonwealth is included. A history of the problem is outlined also.

CHESTER, ALBERT HUNTINGTON, 1843-1903.

1. The gravels of the southern Delaware Peninsula: Amer. Jour. Sci. 3rd ser. 29, p. 36-44, 1885. A review of the gravels and sand formations and terraces in Philadelphia and Chester Counties is included.

CHESTER, FREDERICK DIXON

1. Contrasts of the Appalachian Mountains: Saturday lectures, no. 3, 16 p., [Washington, D. C., 1882], [not seen].
2. The State Line Serpentine [Chester County] and associated rocks: Pa. Geol. Survey 2nd, Ann. Rpt. 1887, p. 93-105, 1889. Serpentine dikes are associated with pyroxene-hornblende basic rock and quartz-bearing hornblende gneiss, the latter coming from metamorphozed bronzite-diallage rock. Enstatite-gabbro and gabbro-diorite are present also. All were derived from a pyroxenic magma during the [Precambrian].

CH'IH, CHI SANG

1. Structural petrology of the Wissahickon schist near Philadelphia [Philadelphia County], with special reference to granitization: Ph.D. thesis, Bryn Mawr College, 1949.

CHITTENDON, A. PERCIVAL

1. Mountain structures of Pennsylvania: Amer. Geog. Soc., Bull. 29, p. 175-180, illus., 1897. Argument and measurements show that the ridges are not predominantly synclinal, as previously hinted. The present mountains are a result of accidental relationship to the Cretaceous base level. Monoclinal mountains total 1333 miles, synclinal 245, and anticlinal 334 miles.

CIST, ZACHARIAH

1. New locality of manganese [Luzerne County]: Amer. Jour. Sci. 4, p. 38-39, 1821. Manganese wad in detached masses is found in the Broad Mountain area in Luzerne County. The physical characteristics are given in general.
2. Account of the mines of anthracite in the region about Wilkesbarre [Luzerne County], Pa.: Amer. Jour. Sci. 4, p. 1-16, illus., 1821; Wyoming Hist. Geol. Soc., Proc. 10, p. 98-114, 1909; discussion with title, Remarks on the rocks accompanying anthracite at Wilkesbarre and elsewhere, by W. Maclure: Amer. Jour. Sci. 7, p. 260-261, 1824. A description of the structure and stratigraphy of the area is given along with production figures and physical properties of the coal. Sections are roughly described.

CLAGHORN, CLARENCE R.

1. Notes on the Bernice anthracite coal-basin, Sullivan County, Pa.: Amer. Inst. Mining Engineers, Trans. 17, p. 606-616, illus., 1889. A general review of the basin is given. The [Pennsylvanian] rocks and coal beds are described.

CLAPP, FREDERICK GARDNER. See also Ashley, George Hall, 68; Campbell, Marius Robinson, 8; Daly, Marcel, 1; Munn, Malcolm John, 2; Stone, Ralph Walter, 8.

1. Limestones of southwestern Pennsylvania: U. S. Geol. Survey, Bull. 249, 52 p., illus. incl. geol. map, 1905. Limestones of [Mississippian]-Permian

age are described. Sections are measured; analyses are given. Uses are primarily as ballast, fertilizer, flux, and cement. None are thick or pure.

2. Water resources of the Curwensville, Patton, Ebensburg, and Barnesboro quadrangles [Clearfield, Cambria, Indiana, Bedford, and Blair Counties], Pa.: U. S. Geol. Survey, Water-Supply Paper 110, p. 159-163, 1905. Springs are an important source of water in the region. Wells drilled usually produce water at less than 100 feet, but some are deeper. Ground water is from the [Pennsylvanian] sandstone and shale.
3. The Nineveh and Gordon oil sands in western Greene County, Pa.: U. S. Geol. Survey, Bull. 285, p. 362-366, 1906. The Gordon sand, Devonian, as recognized in the type section in Washington County, is not the same Gordon Stray sand in Greene County. The Nineveh sand in Greene County overlies the Gordon Stray sand, but the two are often confounded . Evidence is presented to show their true relations.
4. Description of the Amity quadrangle [Washington-Greene Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 144, 15 p., illus. incl. geol. maps, 1907. A complete geologic description of the area is given. [Pennsylvanian]-Permian, and Pleistocene rocks are mapped. The rocks are horizontal. Sections are measured. Coal, petroleum, and gas are the important mineral resources. Stone, clay, and shale are also mentioned.
5. Description of the Rogersville [Greene-Washington Counties] quadrangle: U. S. Geol. Survey, Geol. Atlas of U. S. folio 146, 14 p., illus. incl. geol. maps, 1907. [Pennsylvanian]-Permian, and Quaternary rocks are mapped. The Devonian and [Mississippian] rocks are described from well logs. The structure consists of gentle folds. Petroleum, gas, and coal are the mineral resources described.
6. Economic geology of the Amity quadrangle, eastern Washington County, Pennsylvania: U. S. Geol. Survey, Bull. 300, 145 p., illus., 1907. Devonian-Permian rocks are described. Sections are measured. Coal, oil and gas, limestone, sandstone, and clay and shale are the mineral resources described. Well records are included.
7. Influence of geological structure on the occurrence of oil and gas [abs.]: Science ns 29, p. 440, 1909.
8. A proposed classification of petroleum and natural gas fields based on structure: Economic Geology 5, p. 503-521, illus., 1910. The various structural possibilities for oil are presented, and examples cited. Many are from the Commonwealth. The possibilities are: (1) anticlinal and synclinal structures, with modifications, (2) domes, (3) faults, (4) asphalt seals, (5) sedimentary-crystalline contacts, (6) joints, and (7) surrounding volcanic-vent environs.
9. Present and future of natural gas fields in the northern Appalachians: Nat. Gas Jour. 4, no. 3, p. 2-6, illus., 1910. A review of the conditions under which natural gas occurs in the Commonwealth is included. The deeper gas does not come from the same structures by which shallow gas is controlled.
10. Some instances of flowing wells on anticlines [Beaver County] [abs.]: Science ns 32, p. 189-190, 1910; Geol. Soc. Amer., Bull. 21, p. 770, 1910.
11. The present status of natural gas development in Pennsylvania fields: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1908-10, p. 73-80, 1911. This is essentially a progress report, but examples are given of special occurrences of oil and gas down-dip from salt-water wells. Deep drilling is speculated upon.
12. The occurrence of oil and gas deposits associated with quaquaversal structure [Greene County]: Economic Geology 7, p. 364-381, illus., 1912. In considering this structure as a whole, an example from the Commonwealth is used. The Washington anticline is bulged into domes which have trapped petroleum.
13. Outline of the geology of natural gas in the United States: Economic Geology 8, p. 517-542, illus., 1913. A generalized discussion of the occurrence of gas includes the Commonwealth, which has the largest source area, and is second in volume. Descriptions of fields are given, but they are very generalized.

CLARK, ELLIS, JR.

1. The subterraneous watercourses in the magnesian limestones of Lehigh Co., Pa.: Engineering and Mining Jour. 19, p. 433, 1875. Certain creeks are dry in the summer. The streams continue as underground streams and springs.

The underground streams are encountered in limonite mines. Other mines are drained by the cavities. They may be trough-shaped cavities at the bottom of synclines.

CLARK, FRANK R. See Campbell, Marius Robinson, 10.

CLARK, HEBER R.

1. [Coal oil localities in Pennsylvania]: Amer. Phil. Soc., Proc. 9, p. 56-57, 1862. Petroleum is reported in wells in Lawrence, Butler, and Venango Counties. It comes from sandstone, and some is associated with gas.

CLARK, WILLIAM BULLOCK, 1860-1917. See also Bascom, Florence, 9, 10.

1. Memorial of George Huntington Williams [1856-1894]: Geol. Soc. Amer., Bull. 6, p. 432-440, port., 1895.

CLARKE, FRANK WIGGLESWORTH

1. (and Schneider, E. A.). Experiments upon the constitution of natural silicates: Amer. Jour. Sci. 3rd ser. 40, p. 303-312, 405-415, 452-457, 1890; Zeitschrift fur Krystallographie 18, p. 390-418, Leipzig, 1890. A clinochlore is analyzed from West Chester, Chester County, along with many others from elsewhere.
2. (and Schneider, E. A.). On the constitution of certain micas, vermiculites, and chlorites [Chester County]: Amer. Jour. Sci. 3rd ser. 42, p. 242-251, 1891; Zeitschrift fur Krystallographie 19, p. 465-477, Leipzig, 1891. Hallite and vermiculites from Chester County are examined and then used in comparison with other members of the group. Some vermiculites seem to be chlorites in part. Painterite is also analyzed. It is a mixture of plagioclase and serpentine. They are all alteration products, mostly of serpentine.
3. Mineralogical work [of Joseph Leidy, 1823-1891]: Acad. Nat. Sci. Phila., Proc. 75 [Appendix], p. 49-52, 1923.

CLARKE, JOHN MASON, 1857-1925. See also Barrell, Joseph, 4; Hadley, Arthur Twining, 2.

1. James Hall [1811-1898]: New York Univ., Regents Bull. 48, p. 359-364, 1899.
2. Charles Emerson Beecher [1856-1904]: Amer. Geologist 34, p. 1-13, port., 1904.
3. Early Devonic history of New York and Eastern North America: New York State Museum, Mem. 9, 2 vols., 916 p., illus., 1908. A monographic treatment of the rocks and the fossils is given. The Commonwealth is included in part. Fossils are illustrated and described.
4. (and Ruedemann, Rudolph). The Eurypterida of New York: New York State Museum, Mem. 14, 2 vols., 439 p., illus., 1912. This is a complete treatise on the animals. Some from the Commonwealth are also included. All are described and illustrated.
5. Charles Smith Prosser [1860-1916]: Science ns 44, p. 557-559, 1916.
6. Devonian glass sponges [Erie County]: New York State Museum, Bull. 196, p. 177-198, illus., 1917 [1918]. Sponges are described and illustrated from Upper Devonian rocks near Erie. They are *Ceratodicyta onyx*, *Hydnocerina armstrongi*, and *Ozospongia johnstoni*.
7. A great American geologist of the last century, Professor James Hall (1811-1898): Geological Mag. 57, p. 483-486, port., London. 1920.
8. James Hall, of Albany, geologist and paleontologist, 1811-1898: 565 p., illus. incl. port., Albany, New York, 1921.

CLAUS, CLYDE ROBERT

1. The oil and gas producing horizons in Pennsylvania: Compass 16, p. 103-104, 1936. A review, showing that the petroleum comes from Devonian-Pennsylvanian rocks, is given. No details are included.

CLAVEN, WALTER

1. Some hyperthenes from southeastern Pennsylvania and Delaware; a chemical, optical, and x-ray analysis: Ph.D. thesis, Bryn Mawr College, 1949.

CLAYPOLE, EDWARD WALLER, 1835-1901. See also Sherwood, Andrew, 1; White, Israel Charles, 12.

1. Note on a large fish-plate from the upper Chemung (?) beds of [Susquehanna County] northern Pennsylvania: Amer. Phil. Soc., Proc. 20, p. 664-666, 667, illus., 1883. A plate of *Pterichthys ?rugosus* is described.
2. Note on the occurrence of *Holoptychius*, about 500 feet below the recognized top of the Chemung group, in Bradford Co.,—[Part] B *of* Geological notes: Amer. Phil. Soc., Proc. 20, p. 531, 1883. A scale of the ganoid fish, *Holoptychius*

americanus, occurs in what is considered green Chemung rocks. Previous to this find, this form had been limited to the overlying Catskill red rocks.

3. On a mass of Catskill rocks supposed to exist on the north bank of Towanda Creek, near Franklin [Bradford County],—[Part] C *of* Geological notes: Amer. Phil. Soc., Proc. 20, p. 531-533, illus. [on p. 535], 1883. Catskill rocks mapped in the county near Franklin, as an outlier, are shown to really be a red tongue of the underlying Chemung Formation.
4. On the equivalent of the Schoharie grit of New York in [Perry County] central Pennsylvania, — [Part] E *of* Geological notes: Amer. Phil. Soc., Proc. 20, p. 534-536, 1883. Ferruginous, calcareous, and argillaceous limestone overlie the Oriskany sandstone in the county. The Schoharie and Cauda-galli grits overlie the Oriskany sandstone in New York. *Atrypa impressa* is found in all these formations overlying the Oriskany sandstone. They are postulated to be a seaward and shoreward facies of equivalent-time sea.
5. On the Kingsmill white sandstone [Perry County]: Amer. Phil. Soc., Proc. 20, p. 666-673, 1883; discussion by J. P. Lesley, p. 673-675. A white sandstone in the basal part of the Devonian Catskill beds is described. It is fossiliferous and may be an equivalent of the Panama conglomerate of farther west. If its position were to change stratigraphically, it would have to be down into the Chemung [or Portage] Formations.
6. On the occurrence of fossiliferous strata in the lower Ponent (Catskill) group of middle [Perry County] Pennsylvania: Amer. Naturalist 17, p. 274-282, 1883. The Catskill beds ordinarily are very devoid of fossils. Extensive collecting in undisputed Catskill rocks by the author has revealed a few more so that only [Protozoa], [Bryozoa], cephalopods, and annelids are unknown. He gives no details.
7. Note on a large crustacean from the Catskill group of [Wyoming County] Pennsylvania: Amer. Phil. Soc., Proc. 21, p. 236-239, illus., 1884. *Dolicocephala lacoana,* allied to *Eurypterus,* is described from near Meshopen. Only a head is present.
8. Note on the genus *Rensselaeria* in the Hamilton group in Perry County: Amer. Phil. Soc., Proc. 21, p. 235-236, 1884. *Rensselaeria marylandica* is reported from a sandstone member of the upper part of the Hamilton group. The sandstone reaches a thickness of 800 feet at Susquehanna gap, and is overlain and underlain by shale.
9. On some remains of fish from the Upper Silurian rocks of [Perry County] Pennsylvania [abs.]: Geological Mag. 3rd ser. 1, p. 519-521, London, 1884; British Assoc. Adv. Sci., Rpt. [1884] 54, p. 733-734, London, 1885. The remains of *Paleaspis* and *Onchus* are compared with similar forms from Europe and the conclusion is reached that the American forms are the oldest vertebrates known.
10. On the Clinton and other shales, etc., composing the fifth group of Rogers in the first survey of [Perry County] Pennsylvania: Amer. Phil. Soc., Proc. 21, p. 492-502, 1884. The section from the top of the Tuscarora quartzite to the bottom of the Lewistown [Helderberg] limestone is considered to be Silurian when related to the New York section. Lithologic and paleontologic evidence is given.
11. On the equivalent of the New York Portage in Perry County, middle Pennsylvania: Amer. Phil. Soc., Proc. 21, p. 230-235, 1884. The Cardiola shale is identified physically and paleontologically between the Portage-Chemung rocks above and the Genessee shale below. It is equivalent to the Portage Formation of New York. The fossils are listed
12. On the Hamilton sandstone of middle Pennsylvania [abs.]: Amer. Assoc. Adv. Sci., Proc. 32, p. 244-246, 1884.
13. Preliminary note on some fossil fishes recently discovered in [Perry County] North America: Amer. Naturalist 18, p. 1222-1226, 1884. The Silurian Bloomfield red sandstone has yielded plates of cephalaspid fish, the earliest known in the world. The genus *Paleaspis* is described in detail.
14. [The crumbling of the earth's crust as shown by a section across Huntingdon, Juniata, and Perry Counties] [abs.]: Science 4. p. 258, 1884.
15. The Perry County fault. Note on an important correction in the Geological Map of Pennsylvania: Amer. Phil. Soc., Proc. 21, p. 218-225, illus., 1884.

A reverse fault with a throw of 6510 feet and heave of 4050 feet brings the Helderberg and Hamilton Formations against Chemung shales. It is the New Bloomfield fault. Another fault, the New Germany, is a few miles north and parallel to the first. Here the lower Hamilton is thrust over the upper Hamilton Formation.

16. A preliminary report on the paleontology of Perry County, describing the order and thickness of its formations and its folded and faulted structure: Pa. Geol. Survey 2nd, F2, xxii, 437 p., illus. incl. geol. map, 1885. A complete description of the county, with emphasis on the paleontology is given. [Ordovician]-[Mississippian] rocks are present, as is [Triassic] diabase. Special description is made of the larger faults. Iron ore is the chief economic product. Paint ore, clay, and sand are minor products. Sections are measured; fossils are listed.
17. On *Ctenacanthus* and *Gyracanthus* from the Chemung of [Tioga County?] Pennsylvania [abs.]: Amer. Assoc. Adv. Sci., Proc. 33, p. 489-490, 1885.
18. On the recent discovery of pteraspidian fish in the Upper Silurian rocks of [Perry County] North America: Geol. Soc. London, Quarterly Jour. 41, p. 48-64, illus., 1885. Plates of *Palaeaspis americana, P. bitruncata, Onchus pennsylvanicus,* and *O. clintoni* are described from the [Bloomsburg] beds. They are the earliest known fish in North America.
19. Pennsylvania before and after the elevation of the Appalachian Mountains—a study in dynamical geology: Amer. Naturalist 19, p. 257-268, illus., 1885. An attempt is made to deduce the amount of crustal shortening which took place during the Appalachian folding. A length of 153 miles has been compressed into 65 miles. Much of it is in the Great Valley where 95 miles is compressed to 16. He speculates on how the entire crust of the earth is shrinking and the radius is lessening. He attributes it in part to cooling.
20. Report on some fossils from the lower Coal Measures near Wilkes-Barre, Luzerne County, Pennsylvania: Wyoming Hist. Geol. Soc., Proc. 2, p. 239-253, illus., 1886. Pelecypods and gastropods are described. Some are illustrated. Exact stratigraphic and geographic locations are not given.
21. The materials of the Appalachians: Amer. Naturalist 21, p. 955-962, 1054-1060, illus., 1887. The volume of Paleozoic sediments is discussed, and sources are considered. By and large, the source seems to have been from the southeast. The size of this mass is discussed. The white milky quartz of the great conglomerates are used as examples. Land arose at different times to create "pulses" of clastic material.
22. The four great sandstones of Pennsylvania [abs.]: Amer. Assoc. Adv. Sci., Proc. 36, p. 227, 1888.
23. Perry County fossils, *in* Catalogue of the geological museum, Part 3: Pa. Geol. Survey 2nd, 000, p. 123-174, 1889. This is a catalogue of the fossils listed in report FF of the Survey. Locations are listed.
24. The making of Pennsylvania: Amer. Geologist 5, p. 225-234, 1890. A generalized description of the historical geology of the Commonwealth is given. It is a resumé, with no new data added.
25. An episode in the Paleozoic history of Pennsylvania: Amer. Geologist 8, p. 152-159, 1891. The Hamilton group in Pennsylvania is described and compared to the type section in New York. Much sand is intercalated in the otherwise predominantly shale unit. It may be from a large river which poured sand into the sea. The historical geography is considered. Fossils of the Hamilton group are listed.
26. On the structure of the American [Perry County] pteraspidian, *Palaeapis* (Claypole) — with remarks on the family: Geol. Soc. London, Quarterly Jour. 48, p. 542-561, illus., 1892. The shields of this genus are described in detail and the relations of this specimen to the whole family are discussed.
27. The Devonian era in the Ohio basin: Amer. Geologist 32, p. 15-41, 79-105, 240-250, 312-322, 335-353, illus., 1903. This is a detailed discussion of the Devonian System. Sections are measured; fossils are listed. Paleogeography is considered important. It deals largely with Ohio but includes western Pennsylvania.

CLEAVES, ARTHUR BAILEY. See also Bryan, Kirk, 1; Stow, Marcellus Henry, 3; Willard, Bradford, 17, 41, 51.

1. Middle Devonian branchiopod from Perry County, Pa.: Jour. Paleontology 9, p. 6, illus., 1935. *Schizodiscus antecrenulus* is reported as new from the Moscow shale near New Bloomfield.
2. Structural geology of the New Bloomfield quadrangle [Perry County], Pennsylvania: Pa. Acad. Sci., Proc. 9, p. 141-146, illus., 1935. The quadrangle is characterized by (1) a narrow anticline in the north, (2) a central anticlinal region with minor folds, and (3) a broad southern syncline. All plunge easterly. Ordovician to Mississippian rocks are exposed.
3. Oriskany thicknesses in Pennsylvania: Pa. Acad. Sci., Proc. 11, p. 64-71, illus., 1937. The Oriskany Formation is divided into the upper Ridgeley sandstone and the lower Shriver chert. The thicknesses of these units vary considerably from place to place and between each other. Many locations and thicknesses are given.
4. Geology of the tunnels on the proposed South Penn turnpike—Synopsis: Pa. Acad. Sci., Proc. 12, p. 124-129, 1938. The geology of nine abandoned tunnels is considered persuant to their completion for the Pennsylvania turnpike. Sections are described at each portal.
5. The Oriskany group, *in* The Devonian of Pennsylvania, by B. Willard: Pa. Topog. Geol. Survey 4th ser., G 19, p. 92-130, illus., 1939. The Oriskany group in outcrop consists of the Ridgeley sandstone above and the Shriver siliceous limestone, shale, and chert below. The thickness varies. Detailed sections are measured; fossils are illustrated.
6. Geology and its application to Pennsylvania turnpike — [Part 1]: Pa. Dept. Internal Affairs, Monthly Bull. 8, no. 12, p. 3-6, illus., 1940; — [Part 2] 9, no. 1, p. 3-10, illus., 1940. This is a popular discussion of the way in which geologic knowledge is used in connection with the turnpike.
7. Pennsylvania turnpike [field] excursion: Field Conf. of Pa. Geologists, 14th, 15 p. (#), [Harrisburg] 1948. A mimeographed road log of the geology along the Turnpike from Carlisle to Allegheny tunnel is given. No details are included.
8. (and Ashley, George Hall). Guidebook to the geology of the Pennsylvania Turnpike: Pa. Topog. Geol. Survey [4th ser.], G 20, iv, 37 p., illus. incl. geol. maps, 1942; (and Stephenson, Robert Charles) revised, G-24, 72 p., illus. incl. geol. map, 1949. In a guidebook, from Irwin to Carlisle, Ordovician-Pennsylvanian rocks are described. Cross sections of tunnels are given.

CLELAND, HERDMAN FITZGERALD

1. Memorial of Henry Shaler Williams [1847-1918]: Geol. Soc. Amer., Bull. 30, p. 47-65, port., 1919.

CLEMSON, T. G.

1. Report of a committee appointed by the Geological Society of Pennsylvania, on a geological survey of York County: Advocate of Sci. and Annals of Nat. Hist. 1, p. 163, 1834 [not seen].
2. Analyses of minerals [Cambria County] . . .: Geol. Soc. Pa., Trans. 1, p. 271-274, 1835. Two types of coal and one type of siderite are analyzed. They are described physically, but the stratigraphic and geographic locations are not given.
3. Examination and analyses of several coals and iron ores, accompanying Mr. R. C. Taylor's account of the coal field of Blossburg [Tioga County]: Geol. Soc. Pa., Trans. 1, p. 220-223, 1835. Analyses of six coals and three iron ores are made. The materials are also described physically.

CLERC, F. L.

1. The mining and metallurgy of zinc in the United States [Lehigh County]: Engineering and Mining Jour. 36, p. 148-149, 1883. A discussion of the zinc-ore body near Easton includes much mining and metallurgy along with the general geologic description.

CLOOS, ERNST

1. Crustal shortening and axial divergence in the Appalachians of southeastern Pennsylvania and Maryland: Geol. Soc. Amer., Bull. 51, p. 845-872, illus. incl. geol. maps, 1940. The crustal shortening in the Appalachians is computed from various locations, primarily the anthracite basins. As folds die out, the axes change direction. The basement trends do not correspond with the

Appalachian trends. The Glenarm series and Catoctin volcanic rocks participated in the Appalachian Revolution. The Appalachian folding did not include basement rocks.

2. Flowage and cleavage in Appalachian folding: New York Acad. Sci., Trans. 2nd ser. 3, p. 185-190, 1941. The method of measuring oolite deformation as a function of rock flowage and distortion is described, using localities in Franklin County and elsewhere as examples.
3. (and Hietanen, Anna Martta). Geology of the "Martic overthrust" and the Glenarm series in [Lancaster-York Counties] Pennsylvania and Maryland: Geol. Soc. Amer., Special Paper 35, xiii, 207 p., illus. incl. geol. map, 1941. The details of the crystalline schists and the lower Paleozoic sedimentary rocks are shown. Petrofabrics and detailed structural mapping are included. Rocks are mapped with no age determinations given.
4. (and Broedel, Carl Huntington). Reverse faulting north of Harrisburg [Dauphin-Perry Counties], Pennsylvania: Geol. Soc. Amer., Bull. 54, p. 1375-1397, illus., 1943. The crustal shortening of the Appalachians caused beds to adjust the same volume in less area. This is accomplished by flowage, folding, and reverse faulting. Examples of the latter are presented. Fabric diagram statistics are given.
5. Memorial of Edward Bennett Mathews [1869-1944]: Amer. Mineralogist 30, p. 135-141, port., 1945.
6. Oolite deformation in the South Mountain fold, Maryland [and southeast Pennsylvania]: Geol. Soc. Amer., Bull. 58, p. 843-918, illus., 1947. Deformed oolites are compared to strain ellipsoids to show how they fit into the folding pattern. The intensity of the folding decreases westward, as does the amount of oolite deformation. The deformation includes the Precambrian rocks. The oolites are in Cambro-Ordovician limestones.
7. Structures of the basement rocks of Pennsylvania and Maryland and their effect on overlying structures [abs.]: Oil and Gas Jour. 47, no. 24, p. 90, 1948; Amer. Assoc. Petroleum Geologists, Bull. 32, p. 2162, 1949.
8. (and Chapman, Randolph). "Martic overthrust" area [Lancaster County]: Field Conf. of Pa. Geologists, 15th, [12 p. (#)], illus., Lancaster, 1949. This is an itinerary of a field trip covering the controversial thrust area. Precambrian(?)-Ordovician rocks are described.

CLOUD, PRESTON ERCELLE, JR.

1. *Scolithus* remains in the Cambrian quartzites of [Franklin County] southern Pennsylvania: Rocks and Minerals 9, p. 131, 1934. A boulder of Mount Alto quartzite with *Scolithus* borings is described, along with a discussion of the origin of *Scolithus*.

COCKERELL, THEODORE DRU ALLISON

1. New species of North American fossil beetles, cockroaches [Mercer-Jefferson Counties], and tsetse flies: U. S. Natl. Museum, Proc. 54, p. 301-311, illus., 1918. Some fragments of *Atimoblatta reducta* from the Conoquenessing shale of Mercer County, *Phoberoblatta reticulata, Cobaloblatta simulans, Brachymylacris bassleri, Ptilomylacris medialis, Phthinomylaris pauper,* and *Atimoblatta flexuosa* from Homewood shales of Jefferson County are described.

COHEN, EMIL WILHELM, 1842-1905.

1. Das Meteoreisen von Millers Run bei Pittsburgh [Allegheny County] . . .: Naturw. Verein Neuvorpommern und Rugen in Greifswald, Mitth. 35, p. 39-42, 1904. The meteorite is described physically and analyzed.

COHN, HOE HAROLD

1. The origin of the Venango second sand formation: M.S. thesis, Univ. Pittsburgh, 1940.

COLBERT, EDWIN HARRIS

1. (and Chaffee, Robert Gibson). The type of *Clepsysaurus pennsylvanicus* [Lehigh County] and its bearing upon the genus *Rutiodon*: Acad. Nat. Sci. Phila., Notulae Naturae 90, 19 p., illus., 1941. Lea's type specimen is reexamined in detail. (1) It is a phytosaur; (2) it is not *Rutiodon;* (3) it resembles *Machaeroprosopus* closely; other forms are from New Jersey.
2. Lower jaw of *Clepsysaurus* [Montgomery County] and its bearing upon the relationships of this genus to *Machaeroprospus*: Acad. Nat. Sci. Phila.,

Notulae Naturae 124, 7 p., illus., 1943. A lower jaw of *C. pennsylvanicus* is described and illustrated from the Lockatong Formation of Triassic age. It is compared with a similar reptile from the western United States.

COLE, WILLIAM STORRS

1. Erosion surfaces of western and central New York: Jour. Geology 46, p. 191-206, illus., 1938. The Allegheny and Upland erosion surfaces are traced from northwestern Pennsylvania into New York. Structure and rock resistance are the major controls.
2. Nomenclature and correlation of Appalachian erosion surfaces: Jour. Geology 49, p. 129-148, illus., 1941. Three erosion surfaces are recognized and described. The Schooley peneplain is the upper, most extensive one. The Harrisburg surface is below this. The lowest, or youngest surface, is the Somerville strath in the east which is correlated with the Parker strath in the west. The only age determination is that the Parker (Somerville) strath is pre-glacial.

COLLIE, GEORGE LUCIUS

1. Ordovician section near Bellefonte [Centre County], Pa.: Geol. Soc. Amer., Bull. 14, p. 407-420, illus., 1903. Over 6700 feet of Ordovician rocks are measured. One thousand feet are shales, the rest are limestone. The units described are, from bottom to top: Beekmantown, Stones River, Black River, Trenton, Utica, and Lorraine Formations. Fossils are listed, and those which are new are described.

COLLINS, LEIGH R. See Miller, Arthur Keith, 4.

COLLINS, WILLIAM DENNIS

1. (and Howard, C. S.). Index of analyses of natural waters in the United States: U. S. Geol. Survey, Water-Supply Paper 560, p. 53-85, 1925. A briefly annotated bibliography of papers with water-analyses included is given. It is indexed to states, including the Commonwealth.

COLLINS, WILLIAM HENRY, 1878-1937. See Ashley, George Hall, 58.

COMSTOCK, THEODORE BRYANT, 1849-1915.

1. (and others). Edward [Waller] Claypole [1835-1901]: Amer. Geologist 29, p. 1-47, port., 1902.
2. Memoir of Edward Waller Claypole [1835-1901]: Geol. Soc. Amer., Bull. 13, p. 487-497, 1903.

CONNER, ELI T. See Griffith, William, 3.

CONRAD, TIMOTHY ABBOTT, 1803-1877. See also Leidy, Joseph, 4; Rogers, Henry Darwin, 2.

1. Description of five new species of fossil shells [Cambria County] . . .: Geol. Soc. Pa., Trans. 1, p. 267-270, illus., 1835. *Stylifer primogenia, Turbo tabulatus, T. insectus, Productus confragosus,* and *Pecten armigerus* are described from [Pennsylvanian] beds. The exact stratigraphic and geographic location is not clear. Other specimens are listed.
2. On the Silurian system, with a table of the strata and characteristic fossils: Amer. Jour. Sci. 38, p. 86-93, illus., 1840. The use of European names in America and American Silurian names in Europe is noted. A fish, *Holoptychus nobilissimus,* is mentioned from [Devonian] red beds in Tioga County. It is present in the Old Red sandstone of Europe. Fossils are listed.
3. Observations on the Silurian and Devonian systems of the United States, with descriptions of new organic remains: Acad. Nat. Sci. Phila., Jour. 8, p. 228-280, illus., 1842. A generalized description of the [Ordovician]-Devonian formations from New York to the Cincinnati area. Some of the more common fossils are mentioned. *Nuculites, Lingula, Bellerophon, Cyrtolites,* and *Asaphus* are described, but no locations are given.
4. Description of a new species of *Myacites* [Chester County]: Acad. Nat. Sci. Phila., Proc. [9] 1857, p. 166, 1857; Proc. [12] 1860, p. 55, illus. (pl. 1), 1860. *M. pennsylvanicus,* a clam, is described from the [Lockatong] shale near Phoenixville.
5. Observations on the Eocene lignite formation of the United States: Acad. Nat. Sci. Phila., Proc. [17] 1865, p. 70-73, 1865; Amer. Jour. Sci. 2nd ser. 40, p. 265-268, 1865. Lignite from Cumberland County is thought to be a remnant of a large blanket of Eocene material which once covered much of the eastern United States.

COOK, GEORGE HAMMEL, 1818-1889.

1. Annual report of the [New Jersey] state geologist for the year 1864: 24 p., illus. incl. geol. map, Trenton, New Jersey, 1865. A geologic map and cross section includes the eastern part of the Commonwealth. It is very generalized.
2. On the southern limit of the last glacial drift across New Jersey, and the adjacent parts of New York and [Northampton County] Pennsylvania: Amer. Inst. Mining Engineers, Trans. 6, p. 467-470, illus., 1879. The [Wisconsin] terminal moraine is traced across the Delaware River into the Commonwealth. No new data are included.

COOKE, JOSIAH PARSONS, 1827-1894. See also Torrey, John, 1.

1. Crystallographic examination of some American chlorites: Amer. Jour. Sci. 2nd ser. 44, p. 201-206, illus., 1867. Kämmererite and clinochlore from Lancaster County and clinochlore from Chester County are described and analyzed.
2. The vermiculites, their crystallographic and chemical relations to the micas . . .: Amer. Acad. Arts and Sci., Proc. 9, p. 35-67, illus., 1874. A general discussion of the group includes some from the Commonwealth. Hallite is first described from Chester County; jeffersite is also described and analyzed in detail.
3. Melanosiderite, a new mineral species from Mineral Hill, Delaware County, Pennsylvania: Amer. Acad. Arts and Sci., Proc. 10, p. 451-452, 1875. A new member of the limonite group is described and analyzed.
4. (and Gooch, F. A.). On two new varieties of vermiculites [Delaware County], with a revision of the other members of this group: Amer. Acad. Arts and Sci., Proc. 10, p. 453-462, 1875. A general discussion of the groups includes a description and analysis of an unnamed vermiculite from Lerni.

COOLEY, RALPH

1. A geological history of the McConnell Mills area, [? Allegheny County], Pennsylvania: M.S. thesis, Univ. Pittsburgh, 1935.

COOPER, BYRON NELSON

1. Status of Mississippian stratigraphy in the central and northern Appalachian region, *in* Symposium on problems of Mississippian stratigraphy and correlation, by J. M. Weller: Jour. Geology 56, p. 255-263, illus., 1948. Abundant floras and faunas make the Mississippian System a good unit to study. The major features are outlined, some of which are in the Commonwealth. Some generalized correlations are shown.

COOPER, CHALMER LEWIS

1. Occurrence and stratigraphic distribution of Paleozoic ostracodes: Jour. Paleontology 16, p. 764-776, illus., 1942; reprinted *as* Ill. State Geol. Survey, Rpt. Inv. 83, 1942. The Commonwealth is included. Key ostracode zones are outlined and the more important genera are mentioned.

COOPER, GUSTAV ARTHUR

1. A new species of the echinoid *Lepidesthes* [Warren County]: Amer. Jour. Sci. 5th ser. 22, p. 531-538, illus., 1931. *Lepidesthes warrenensis* is described from the Waverly group near Warren. It may be Lower Mississippian or Upper Devonian.
2. (and Whitcomb, Lawrence). *Salonia,* a new Ordovician brachiopod genus [Clinton County]: Wash. Acad. Sci., Jour. 23, p. 496-503, illus., 1933. A pentamerid, *Salonia magnaplicata,* is described and illustrated from the Salona Formation of Ordovician age.
3. Collecting fossils in . . . Pennsylvania . . .: Smithsonian Inst. Exploration and Field Work 1937, Pub. 3480, p. 9-12, illus., 1938. A description of the Tully Formation (Devonian) outcrop in a line across central Pennsylvania is included in a progress report.
4. Facies relations of the Middle Devonian (Hamilton group) along the Catskill front [abs.]: Geol. Soc. Amer., Bull. 52, p. 1893, 1941.
5. (Chairman) Correlation of the Devonian sedimentary formations of North America [Chart no. 4]: Geol. Soc. Amer., Bull. 53, p. 1729-1793, illus., 1942. The Devonian System of the Commonwealth is studied in different parts of the Commonwealth and around the United States. A brief basis of correlation is included.
6. [Charles Elmer Resser, 1889-1943]: Wash. Acad. Sci., Jour. 34, p. 32, 1944.

COOPER, H. M.

1. (and Abernathy, R. F.). Analyses of mine samples. *in* Analyses of Pennsylvania bituminous coal: U. S. Bur. Mines, Tech. Paper 590, p. 131-239, 1939. Proximate, ultimate, and other analyses are made of several hundred samples from throughout the Commonwealth
2. (and Abernathy, R. F.). Description of mine samples, *in* Analyses of Pennsylvania bituminous coals: U. S. Bur. Mines, Tech. Paper 590, p. 241-485, 1939. Very detailed physical descriptions of coal beds are given in connection with sampling from various parts of the Commonwealth.

COOPER, THEODORE

1. New theory on the formation of coal [Lackawanna County]: Engineering and Mining Jour. 32, p. 103, 1881; discussion with title, Jelly-like substance resembling dopplerite . . .: Amer. Jour. Sci. 3rd ser. 22, p. 489, 1881; discussion with title, On a peculiar coal-like transformation of peat, recently discovered at Scranton, Penn., by H. L. Fairchild: New York Acad. Sci., Trans. 1, p. 71-75, 1882; discussion, p. 75-76. A jelly-like bitumen which hardens when exposed to air is described. The author calls it carbonized jelly. It is later shown to be [dopplerite] [phytocolite].

COPE, EDWARD DRINKER, 1840-1897.

1. On vertebrates of the Mesozoic red sandstone from Phoenixville, Chester Co., Pa.: Acad. Nat. Sci. Phila., Proc. [18] 1866, p. 249-250, 1866. Parts of *Rhytidodon, Mastodontosaurus, Belodon,* and *Eurydorus* are described. Most are teeth. They indicate a Triassic age, rather than Jurassic, for the rocks.
2. [The Triassic age of the Mesozoic sandstone of Pennsylvania]: Acad. Nat. Sci. Phila., Proc. [18] 1866, p. 290, 1866. *Pterodactyl longispinus* is mentioned from the [Triassic] rocks of the Commonwealth. Other forms are used to correlate the red sand with the Triassic of Europe. No details are given, however.
3. On the Reptilia of the Triassic formations of the Atlantic region: Amer. Phil. Soc., Proc. 11, p. 444-446, 1870;; Annals and Mag. of Nat. Hist. 4th ser. 6, p. 498-500, 1870. A generalized resumé of the reptiles from the Triassic includes those of Chester County.
4. Synopsis of the extinct Mammalia of the cave formations . . .: Amer. Phil. Soc., Proc. 11, p. 171-192, illus., 1870. A list of mammals from the U. S. includes Commonwealth specimens.
5. Preliminary report on the Vertebrata discovered in the Port Kennedy [Montgomery County] bone cave: Amer. Phil. Soc., Proc. 12, p. 15, 73-102, illus., 1871. A cave in Cambrian limestone has yielded thirty-four mammal species which are described. Some birds and reptiles are also present. None are pre-Pliocene, suggesting that the climate was not favorable, or the caves were not habitable until after the Pliocene.
6. Descriptions of extinct Vertebrata from the Permian and Triassic formations of [Chester County] the United States: Paleontological Bulletin no. 26, p. 182-193, 1877; Amer. Phil. Soc., Proc. 17, p. 182-193, 1878. Reptiles from the Triassic rocks near the Phoenixville mines include four genera and six species.
7. On some saurians found in the Triassic of Pennsylvania, by C. M. Wheatley: Amer. Phil. Soc., Proc. 17, p. 231-232, 1878; Paleontological Bulletin no. 28, p. 231-232, 1878. Three genera and three species of reptiles are described. No location is given, but probably Chester County. Only teeth are known.
8. On some new and little known Paleozoic vertebrates [Bradford-Tioga Counties]: Amer. Phil. Soc., Proc. 30, p. 221-229, illus., 1892. Six genera and seven species, two new, of fish are described and illustrated from the Chemung and Catskill groups.
9. On a bone cave at Port Kennedy [Montgomery County], Pa. [abs.] Science ns 2, p. 638, 1895.
10. The fossil Vertebrata from the fissure at Port Kennedy [Montgomery County], Pa.: Acad. Nat. Sci. Phila., Proc. [47] 1895, p. 446-450, 1896. Seventeen types of vertebrates are present; three are new and are described. *Uncia mercerii,* a cat; *Smilodon gracilis,* a tiger; and *Crocuta inexpectata,* a hyena, are reported in the Pleistocene of the Commonwealth for the first time.

11. New and little known Mammalia from the Port Kennedy [Montgomery County] bone deposit: Acad. Nat. Sci. Phila., Proc. [48] 1896, p. 378-394, 1897. Thirty-two species of extinct mammals are reported from the cave. They are post-Pliocene, and probably Pleistocene. All are described from bones and teeth.
12. On new Paleozoic vertebrata from . . . Pennsylvania: Amer. Phil. Soc., Proc. 36, p. 71-91, illus., 1897. Among many described are: (1) fish, *Holoptychius serrulatus*, Catskill Formation, Tioga County; *H. latus*, Catskill Formation, Lackawanna County; and *H. flabellatus*, Catskill Formation, Luzerne County; and (2) amphibians, *Ctenerpton alveolum* and *C. tenuicorne* from the [Pennsylvanian] rocks of Beaver County.
13. Vertebrate remains from Port Kennedy [Montgomery County] bone deposit: Acad. Nat. Sci. Phila., Jour. 2nd ser. 11, p. 193-267, illus., 1899. A very detailed description of the Pleistocene and Recent reptiles and mammals from the cave is given. This is a compendium of all previous reports on the deposit.

COPELAND, MARGARET J.

1. The contact of the Wissahickon schist and the hybrid gneiss, north of Bryn Mawr [Chester County], Pennsylvania, as determined by heavy mineral analysis (with a separate map): Ph.D. thesis, Bryn Mawr College, 1949.

CORBIN, J. ROSS

1. Bog-iron ore: Pa. Topog. Geol. Survey [4th ser.], Bull. 59, 5 p. (#), 1922. Bog iron ore occurs as a precipitate of ground water in low, wet areas. The deposits are generally small. Most deposits occur in the northwest part of the Commonwealth. No specific locations are given.
2. Pennsylvania iron ores: Pa. Topog. Geol. Survey [4th ser.], Bull. 20, 3 p. (#), 1921; 2nd ed., 1922. Magnetite, hematite, brown ore [limonite], carbonate, and bog-ore are known from the Commonwealth. Brief mention is made of their occurrences. A bibliography is included.
3. Brown iron ores in Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 63, 8 p. (#), illus., 1923. Brown ore [limonite] occurs in rocks of all ages in the southeastern, southcentral, and western parts of the Commonwealth. A brief description of the ores by age is given, as are analyses.
4. Chromite in Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 74, 7 p. (#), illus., 1923. Chromite occurs associated with serpentine as a magmatic segregation. Analyses are given. It occurs in Lancaster, Chester, Delaware, and Montgomery Counties.
5. Copper ores in Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 71, 8 p. (#). 1923. A general discussion of copper minerals and occurrences in the Commonwealth is given. Nine different minerals are known. Production statistics are included.
6. Gold in Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 77, 13 p. (#), 1923. It has been reported from Lancaster, Lebanon, Berks, Chester, Montgomery, Philadelphia, Bucks, Pike, and Monroe Counties. It is associated with diabase, granite, and as placer.
7. Magnetite in [southeast] Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 61, 6 p. (#), illus., 1923. Magnetite occurs as two types: the Reading Hills type in metamorphic rocks, and the Triassic type, associated with igneous rocks.

CORSS, FREDERIC

1. Buried valley and potholes in the Wyoming [Wyoming County] coal field: Wyoming Hist. Geol. Soc., Proc. 5, p. 168-176, 1900. Evidence is presented to show that the Archbald potholes are pre-glacial in origin. The various deep buried channels in the buried valley are described and various explanations proposed. Coalesced potholes are a possibility.
2. Fossils in the river drift at Pittston [Luzerne County]: Wyoming Hist. Geol. Soc., Proc. 5, p. 163-167, 1900. Unnamed fossils are found in the Susquehanna River. They are said to be Chemung in age, but no details are included.
3. The buried valley of Wyoming [Wyoming County]: Wyoming Hist. Geol. Soc., Proc. 8, p. 42-45, 1904. The buried valley is described. It is filled with glacial drift and is probably pre-glacial. The deeper parts upstream are thought to be caused by differential post-glacial uplift.
4. A study of the glacial rock on Shawnee Mountain [Wyoming County]:

Wyoming Hist. Geol. Soc., Proc. 10, p. 115-117, illus., 1909. Glacial striae are noted on [Pottsville] conglomerate. The lack of weathering in the humid climate is noted.

COSTE, E. See Daly, Marcel, 1.

COXE, ECKLEY B.

1. Note upon a peculiar variety of anthracite [Schuylkill County]: Amer. Inst. Mining Engineers, Trans. 7, p. 213, 1879. A peculiar-looking, dull, greasy bed of anthracite is described. It is probably graphitic; hence, it looks different than ordinary coal.

CRAIG, LAWRENCE CAREY

1. Lower Middle Ordovician of south-central Pennsylvania: Geol. Soc. Amer., Bull. 60, p. 707-779, illus., 1949. Thin bedded, sometimes coarse-textured limestones are common. The Stones River, Shippensburg, Mercersburg, and Oranda limestones are described. The Martinsburg shale is also included. The Shippensburg and Mercersburg Formations are subdivided. The depositional environment is described.

CRAW, W. J.

1. On the "clinochlore" of Chester Co., Pa.: Amer. Jour. Sci., 2nd ser. 13, p. 222-223, 1852. A complete chemical analysis is made of the mineral reported by Blake. Chemically it resembles chlorite except that clinochlore contains chromium and chlorite does not.

CREDNER, HERMANN

1. Die Geognosie und der Mineralreichthum des Alleghany-Systems: Petermanns geog. Mittheilungen 17, p. 41-50, illus., Gotha, 1871. The geographic belts of the Appalachians are described; those of the Commonwealth are compared and contrasted with those to the north and south. The reasons for difference are shown in structural cross sections. The geologic history is briefly reviewed. The mineral products, chiefly coal, iron, and petroleum are described. A geologic map of the eastern United States is included.

CRESSON, HILBORNE T.

1. Early man in Delaware Valley: Boston Soc. Nat. Hist., Proc. 24, p. 141-150, 1889. The Pleistocene deposits of the Delaware River in Philadelphia are discussed. Artifacts are found in these deposits from the State of Delaware.

CREW, B. J. See Ashburner, Charles Albert, 37.

CROSS, AUREAL THEOPHILUS. See Schopf, James Morton, 1.

CUMINGS, EDGAR ROSCOE

1. Memorial of Charles Smith Prosser [1860-1916]: Geol. Soc. Amer., Bull. 28, p. 70-80, port., 1917.
2. Memorial to Edward Martin Kindle [1869-1940]: Geol. Soc. Amer., Proc. 1940, p. 209-225, port., 1941.

CUMINGS, W. L.

1. The Cornwall iron mines near Lebanon [Lebanon County], Pa., *in* Mineral deposits of New Jersey and eastern Pennsylvania, by C. P. Berkey: Internatl. Geol. Cong., 16th, U. S. 1933, Guidebook 8, Excursion A-8, p. 48-54, illus., 1932. A generalized description of the deposit is given. The ore, structure, mineralogy, and mining methods are discussed. Analyses are given.
2. (and Adair, G. L., and Moyer, Forrest T.). [Geology of] area east of Harrisburg, trip C *of*, Pa. Topog. Geol. Survey Centennial Celebration [Fieldtrip]: p. 16-18 (#), [Harrisburg] 1936. This is a mimeographed roadlog of a trip from Harrisburg to Cornwall. No details are included.

CUMMINS, A.

1. Geology of the natural gas fields about Pittsburgh [Allegheny County]: Engineering and Mining Jour. 54, p. 106-107, 1892. The Murraysville and Grapeville fields are on an anticline. The producing sands are in the Mississippian rocks. The physical features of the fields are described, as are some of the rocks encountered in the wells.

CUNNINGHAM, K. M.

1. New find of fossil diatoms [Philadelphia County] [abs.]: Science 7, p. 35, 1886.

CURTIS, LAWRENCE W.

1. Geology of the vicinity of Dry Run, [? Franklin County] Pennsylvania: M.A. thesis, Columbia Univ., 1942.

DADDOW, SAMUEL HARRIES

1. (and Bannon, Benjamin). Coal, iron, and oil . . .: 808 p., illus., Bannon, Pottsville, 1866. This is a general treatise on these substances, designed as a handbook for engineers. It contains many descriptions of deposits, etc. from the Commonwealth.
2. Map of the anthracite coal fields of Pennsylvania: Scale, 1 inch equals 5 miles, Bannon, Pottsville, [1866?].

DALE, THOMAS NELSON

1. The slate industry at Slatington [Lehigh County], Pa. . . .: U. S. Geol. Survey, Bull. 213, p. 361-364, 1903. A generalized description of the slate in the [Martinsburg] Formation is given. The structure is recognized as complex. No details are given.
2. (and others). Slate deposits and slate industry of the United States: U. S. Geol. Survey, Bull. 275, 154 p., illus., 1906; revised, Bull. 586, 220 p., illus. incl. geol. map, 1941. A complete description of slate is given, with details from all the deposits of the country, including the Commonwealth. The slate belts of Northampton and Lehigh Counties, and of Lancaster and York Counties are described.

DALL, WILLIAM HEALY

1. (and Harris, Gilbert Dennison). Correlation papers—Neocene: U. S. Geol. Survey, Bull. 84, 349 p., illus., 1892. A complete discussion of the Tertiary System of the United States includes the Commonwealth. No deposits are formally recognized, but those commonly thought to be Tertiary are discussed. High gravels near Philadelphia and the Bryn Mawr gravel could be post-Tertiary or Cretaceous.
2. Charles Emerson Beecher [1856-1904]: Science ns 19, p. 453-455, 1904.
3. Biographical memoir of Charles Emerson Beecher, 1856-1904: Natl. Acad. Sci., Biog. Mem. 6, p. 57-70, port., 1906

DALY, MARCEL R.

1. The diastrophic theory: Amer. Inst. Mining and Metallurgical Engineers, Trans. 56, p. 733-781, 1917; Bull. 115, p. 1137-1157, illus., 1916; discussion by E. Coste and F. G. Clapp, Bull. 120, p. 2204-2211, 1916; reply by author, Bull. 125, p. 871-891, 1917. Evidence is presented to show that petroleum is accumulated mechanically by diastrophic forces. Examples are drawn from the Commonwealth.
2. Geosynclines and petroliferous deposits. Amer. Inst. Mining and Metallurgical Engineers, Bull. 128, p. 1135-1146, illus., 1917. The relationship between petroleum accumulation and geosynclines is pointed out. The concentration is a result of the tectonism. The Commonwealth is included in the examples.

DALY, REGINALD ALDWORTH

1. Oscillations of level in the belts peripheral to the Pleistocene ice caps: Geol. Soc. Amer., Bull. 31, p. 303-318, illus., 1920. Examples are shown to demonstrate the isostatic readjustment of the land after the glacial ice was removed. The "deeps" in the Susquehanna River in Lancaster County are used as evidence. They may have been formed by an increased gradient resulting from crustal uplift.

DANA, EDWARD SALISBURY

1. On a crystal of andalusite from Delaware Co., Pa.: Amer. Jour. Sci. 3rd ser. 4, p. 473, illus., 1872. Crystals from Upper Providence are completely described mineralogically. Nothing is mentioned of their occurrence.
2. Diaspore from Newlin [Chester County], Penn., *in* Mineralogical notes: Amer. Jour. Sci. 3rd ser. 32, p. 388, 1886. A prismatic diaspore crystal is described.
3. The system of mineralogy of James Dwight Dana, 1837-1868: Descriptive mineralogy, 6th ed., 1134 p., illus., Wiley, New York, 1892. A textbook of detailed mineralogy includes a catalog of American locations. The Commonwealth is included by counties. No details are given.
4. James Dwight Dana [1813-1895]: Amer. Jour. Sci. 3rd ser. 49, p. 329-356, port., 1895.
5. George Jarvis Brush [1831-1912]: Amer. Jour. Sci. 4th ser. 33, p. 389-396, port., 1912.

DANA, JAMES DWIGHT, 1813-1895. See also Dana, Edward Salisbury, 3; Marcou, Jules, 1, 4.

1. Observations on the origin of some of the earth's features: Amer. Jour. Sci. 2nd ser. 42, p. 205-211, 252-253, 1866. Examples are used from the Commonwealth to support the view of geosynclines receiving sediments in shallow water and slowly settling under the weight.
2. (and Brush, George Jarvis). A system of mineralogy, 5th ed.: xlviii, 827 p., illus., New York, 1868; discussion with title, Uber die regelmäfsigen Verwachsungen der verschiedenen Glimmerarten untereinander sowie mit Pennin und Eisenglanz, by G. Rose: Konigl. preuss. Akad. Wiss. Berlin, Monatsb. 1869, p. 339-362, illus., 1870; Annalen Physik u Chemie 138 [5th ser. 18], p. 177-200, illus., Leipzig, 1869; reply by authors with title, On the magnetite in the mica of Pennsbury [Chester County], Pa. . . .: Amer. Jour. Sci. 2nd ser. 48, p. 360-362, 1869. In a general discussion of iron in micas, Rose comments that a magnetite-bearing chlorite mentioned by Dana is more likely hematite. Dana says it is magnetite.
3. A pothole of remarkable size in Archbald [Lackawanna County], Pa.: Amer. Jour. Sci. 3rd ser. 34, p. 489, 1887. A pothole forty-five feet deep and twenty-feet in diameter is described. It was formed either by glacier meltwater dropping through a crevasse in the ice or by glacial rivers of large size.

DARRAH, WILLIAM CULP. See also Jongmans, Willem Josephus, 4, 5.

1. Recent paleobotanic investigations near Pittsburgh [Allegheny County], Pa.: Pa. Acad. Sci., Proc. 6, p. 110-114, 1932. A generalized discussion of the flora of the Conemaugh Formation. Many genera and species are known. Form-genera *Pecopteris, Neuropteris,* and seeds of *Odontopteris* are mentioned along with a specimen of a branchiosaur amphibian, the first one found in the Pennsylvanian System.
2. (and Bertrand, Paul). Observations sur les flores houillières de Pennsylvania (régions de Wilkes Barre [Luzerne County] et de Pittsburgh [Allegheny County]): Acad. Sci. Paris, C. R. 197, no. 23, p. 1451-1452, 1933; Soc. géol. du Nord, Ann. 58, p. 211-224, Lille, 1933. Paleobotanical lists show that these two areas are the same age but that they cannot be correlated with European beds because of the difference in flora and the lesser data known about the European areas.
3. Leo Lesquereux [1806-1889]: Harvard Univ. Botanical Museum, Leaflets 2, p. 113-119, 1934.
4. Permian elements in the fossil flora of the Appalachian province — [Part] 1, *Taeniopteris:* Harvard Univ. Botanical Museum, Leaflets 3, p. 137-148, 1935; — [Part] 2, *Walchia,* 4, p. 9-19, 1936. Species of these genera are described and discussed as evidence of at least possible Permian rocks in [Greene and Washington Counties].
5. Some late Carboniferous correlations in the Appalachian province [abs.]: Geol. Soc. Amer., Proc. 1934, p. 442-443, 1935.
6. Recent studies of American pteridosperms: Cong. strat. carbonifière, 2nd, Heerlen 1935, C. R. 1, p. 131-137, illus., 1937. While no specific locations are given, seeds from many of these plants are found throughout the Commonwealth. Some from Fair Oaks, Rennerdale, and Monongahela City [Washington County] are illustrated.

DARTON, NELSON HORATIO. See also Barrell, Joseph, 5; Bascom, Florence, 9, 10.

1. Ancient bone cave in [Monroe County] Pennsylvania: Sci. Amer. Supplement 19, p. 7541-7542, 1885. A popular account of Hartman's Cave and the fossils found in it is given.
2. Artesian well prospects in the Atlantic Coastal Plain region: U. S. Geol. Survey, Bull. 138, 232 p., illus., 1896. The coastal plain rocks under the eastern part of Philadelphia are a source of artesian water. Several wells are described. The rocks are Cretaceous.
3. Preliminary list of deep borings in the United States, second edition, with additions: U. S. Geol. Survey, Water-Supply Paper 149, 175 p., 1905. The Commonwealth by county and township is included. A record of wells, depth, diameter, yield, static level, and remarks, is given. There are several hundred included.
4. Notes on sand for mine flushing in the Scranton [Lackawanna County] region: U. S. Bur. Mines, Bull. 25, p. 72-75, 1912. Sandstone for crushing, glacial till,

alluvium, and river sand are available for mine filling. Various deposits are described, but no origin is given.

5. Buried valley of Susquehanna River in Luzerne County, Pennsylvania: Jour. Geology 21, p. 557-563, illus., 1913. A buried valley is topographically mapped by bore-holes. It is filled with till, up to 300 feet deep, though mostly 100-200 feet. The Susquehanna River still occupies it. Other till-filled tributary valleys are also described, such as Newport Creek, Mill Creek, and Lackawanna River. The irregularities in the floor are thought to have been cut by subglacial streams, and the whole valley filled with till as the ice stagnated.
6. Construction of a structure map of the northern anthracite field [abs.]: Wash. Acad. Sci., Jour. 3, p. 199-200, 1913.
7. Sand available for filling mine workings in the northern anthracite basin of Pennsylvania: U. S. Bur. Mines, Bull. 45, 33 p., illus. incl. geol. maps, 1913. Glacial and alluvial sand is mapped as a source of mine fill. Various locations are described. The buried Susquehanna Valley is a big source of sand. Geographic and physical properties are described more than is the origin of the deposits.
8. Some features of the Quarternary deposits in the Wyoming Valley [Luzerne County] region: Wyoming Hist. Geol. Soc., Proc. 13, p. 41-64, illus., 1914. The glacial features in general and the buried valleys in detail are described. Till, terraces, and river gravels are discussed. Cross sections are included. Isopach maps of the gravel are present.
9. Geothermal data of the United States, including many original determinations of underground temperature: U. S. Geol. Survey, Bull. 701, 97 p., illus., 1920. Many wells, in many places in the Commonwealth, are tabulated. Depth and temperature measurements are presented. There is no interpretation given.
10. Memorial of Charles Doolittle Walcott [1850-1928]: Geol. Soc. Amer., Bull. 39, p. 80-116, port., 1928.
11. Some structural features of the northern anthracite coal basin [northeast] Pennsylvania: U. S. Geol. Survey, Prof. Paper 193-D, p. iii, 69-81, illus., 1940. Many cross sections are used to show the structural complexities of the coal basin. Overturned folds and thrust faults are common, and some are of considerable magnitude.

DAVIDSON, F. P.

1. Stilbite, [Part] 5 *of* Mineralogical notes [Berks County]: Amer. Chemical Jour. 6, p. 414, 1885. Stilbite from Rautenbush is described and analyzed.

DAVIES, NATHAN C. See Reeves, John Robert, 2.

DAVIS, C. A.

1. Map of the United States showing distribution of peat deposits . . .: Scale, 1:7,000,000, *in* Mineral Resources of U. S. 1918, pt. 2, pl. 3, 1919; revised by E. K. Soper and C. C. Osborn.

DAVIS, JACOB P.

1. [Geology of Wayne County] [abs.]: Monthly Amer. Jour. Geology 1, p. 520-523, 1832. This is an expanded abstract. [Devonian] rocks are described. Iron carbonate and pyrite are mentioned as ore possibilities.

DAVIS, R. N.

1. An ancient tree [Lackawanna County] Nature Mag. 10, p. 299, illus., 1927. A large, vertical, coalified tree from near Scranton is described popularly, and illustrated. It is over 20 feet long.
2. Glacial potholes of [Lackawanna County] northeastern Pennsylvania [abs.]: Pa. Acad. Sci., Proc. 3, p. 26, 1929.

DAVIS, WILLIAM MORRIS. See also Barrell, Joseph, 5.

1. Lakes and valleys in northeastern Pennsylvania: Science 1, p. 304-305, 1883. Many of the lakes in the region are due to glacial debris having dammed up valleys. The drift is over 300 feet thick in some places.
2. Gorges and waterfalls: Amer. Jour. Sci. 3rd ser. 28, p. 123-132, 1884. The gorge of Waulenpaupack Creek, Blooming Grove Creek, and others in Pike County are explained as resulting from glacial damming and diversion of pre-glacial-streams. Examples in Wyoming County are also cited.
3. A river pirate [Bucks County]: Science 13, p. 108-109, 1889. Evidence that Deer Run has pirated the northeast branch of Perkiomen Creek is presented.

4. The rivers and valleys of Pennsylvania: Natl. Geog. Mag. 1, p. 183-253, illus., 1889; addition with title, On the drainage of the Pennsylvania Appalachians: Boston Soc. Nat. Hist., Proc. 25, p. 418-420, 1892. A general review of the geology and physiography of the Commonwealth is followed by a discussion of drainage patterns. The streams are considered to have been consequent upon the Appalachian folds in Carboniferous time and to have adjusted themselves to the present topography as erosion lowered the land. Later emphasis is on the major drainage being antecedent.
5. The geological dates of origin of certain topographic forms on the Atlantic slope of the United States: Geol. Soc. Amer., Bull. 2, p. 545-584, illus., 1891. Pennsylvania is included in a widespread area. The Cretaceous peneplain included most of Pennsylvania and is recognized by the accordant summits and structure truncation. The superimposed streams on Cretaceous rocks makes the rejuvenation post-Cretaceous. The rejuvenation was by tilting, and was in a series of movements.
6. [Physiographic features of the middle Susquehanna region, Union-Snyder Counties]: Science ns 3, p. 786-787, 1896. Tributaries of the Susquehanna River run parallel to the river for a long way. These are interpreted as having been deflected by the floodplain of the pre-uplift-Susquehanna River.
7. Biographical memoir of [J.] Peter Lesley, 1819-1903: Natl. Acad. Sci., Biog. Mem. 8, p. 155-240, port., 1915.

DAWSON, JOHN WILLIAM, 1820-1899.

1. The successive Paleozoic floras in eastern North America [abs.]: British Assoc. Adv. Sci., Rpt. 35, sec. 50-51, 1866; Canadian Naturalist ns 2, p. 452-454, 1865.
2. A new Erian (Devonian) plant allied to *Cordaites* [Wyoming County]: Amer. Jour. Sci. 3rd ser. 38, p. 1-3, illus., 1889. A fruited plant from the Catskill Formation is described. It resembles *Cordaites* but has a fruit like that of *Noeggerathia*. The name *Dictyo-cordaites lacoi* is proposed.
3. On new plants from the Erian [Wyoming County] and Carboniferous and on the characters and affinities of Paleozoic gymnosperms: McGill Univ., Peter Redpath Museum, Notes on specimens 1890, 28 p., illus., 1890; Canadian Record of Sci. 4, p. 1-28, illus., 1890. A plant *(Dictyo-cordaites)* from Pennsylvania and others from elsewhere are described. Their position as ancestors to Mesozoic gymnosperms is discussed.
4. Thomas Sterry Hunt [1826-1892]: Canadian Record of Sci. 5, p. 145-149, port., 1892.
5. The late Dr. John Strong Newberry [1822-1892]: Canadian Record of Sci. 5, p. 340-343, 1893.

DAWSON, W. See Hall, James, 9.

DAY, DAVID TALBOT

1. A suggestion as to the origin of Pennsylvania petroleum: Amer. Phil. Soc., Proc. 36, p. 112-115, 1897; discussion by S. P. Sadtler, p. 136-137. The theory of the Devonian oil in the Commonwealth as having come from percolation upward from Silurian rocks is supported. Animal-fat distillation by the energy of the Appalachian Revolution occurred, and the distillates rose to the Devonian traps.
2. La variation des charactres des huiles brutes de Pennsylvanie et de l'Ohio: Internatl. Cong. Petroleum, 1st, Paris 1900, Notes, p. 53-56, Paris, 1902. The character of the petroleum is described from the different sands in the Devonian-Mississippian. Apparently filtration is a factor, and it is related to the shales through which the petroleum migrates.
3. [Map of] known productive oil and gas fields of the United States in 1908, 2nd ed.: Scale, 1 inch equals 110 miles, U. S. Geol. Survey, 1909.
4. The conditions of accumulation of petroleum in the earth: Amer. Inst. Mining Engineers, Bull. 42, p. 467-472, 1910; Trans. 41, p. 219-224, 1911. A discussion of the origin of petroleum and of the different kinds of petroleum includes some samples drawn from the Commonwealth.
5. (and others). [Map of] oil and gas fields [of the United States] in 1913: Scale, 1:2,500,000, U. S. Geol. Survey, 1914.

DEAN, BASHFORD

1. Charles Rochester Eastman (1868-1918): Amer. Museum Jour. 18, p. 506-507, 1918.

2. Memorial of Charles Rochester Eastman [1868-1918]: Geol. Soc. Amer., Bull. 30, p. 27-36, port., 1919.

DeCHICCHIS, R. See Emery, Alden H., 1.

DECKER, CHARLES ELIJAH. See also White, Israel Charles, 26.

1. Studies in minor folds: 89 p., illus., Univ. Chicago Press, Chicago, 1920. A treatise deals with minor folds in relation to major folds and to deformation. Many examples are taken from the northwest corner of the Commonwealth.

DEEVEY, EDWARD SMITH, JR.

1. Biogeography of the Pleistocene, Part 1, Europe and North America, [Chapter] 3 *of* Pleistocene research, a review . . . by R. F. Flint, chairman: Geol. Soc. Amer., Bull. 60, p. 1315-1416, illus., 1949. The distribution of organisms is discussed on a world-wide basis, with some data obtained from the Commonwealth. The major emphasis is on plants. No specific details are given.

DeLONG, CHARLES B. See Rogers, R. Douglas, Jr., 1.

DeLURY, JUSTIN SARSFIELD

1. Les principaux gisements de minerals de zinc des Etats-Unis d'Amerique: Revue Universelle des Mines 4th ser. 6, p. 221-257, illus., Liege, 1904. A review of the occurrences of zinc in the United States includes a brief mention of the various mines in Lehigh County. No details are given.

DEMAREST, DAVID FRANKLIN. See also Pepper, James Franklin, 1, 2.

1. Map of the Berea and Murrysville sands of . . . western Pennsylvania . . . shows thickness of the sand and oil and gas pools in the sands: U. S. Geol. Survey, Oil and Gas Inv., Prelim. Map 49. Map with cross sections and text, scale, 1 inch equals 3 miles, 1946. An isopach map of the Berea-Corry sands and the Murrysville (Cussewago) sand is given. Oil and gas pools are outlined on it. Cross sections are shown which indicate that the various sand bodies merge eastward into the Pocono group. The sand formations are described.

DEMMING, HENRY C.

1. The geology, petrography, and mineralogy of York County—past, present and future: Engineering Soc. York, Pa., Proc. 2, p. 65-70, 1913. A review of the geology of the county is given. Few details are included.

DETRICK, WALTER SCHLAGER

1. Geology of the vicinity of State College [Centre County], Pa. (Bellefonte quadrangle): Compass 12, p. 133-134, 1932. A very brief resumé of the geology of the area is given. No details are included.
2. Summary of the geology of Pennsylvania: Compass 12, p. 130-132, 1932. An extremely brief resumé of the geology of the Commonwealth is given. No details are included.

DEWEES, JOHN H.

1. Report of progress in the Juniata district on the fossil iron ore beds of middle Pennsylvania: Pa. Geol. Survey 2nd, F, p. 1-139, illus. incl. geol maps, 1878; preface by J. P. Lesley, p. vii-xlix. This is a description of the sedimentary hematite of the [Silurian] and [Devonian] rocks. Local areas are described in detail stratigraphically. Analyses are made; sections are measured, and fossils are listed.
2. (edited by J. Peter Lesley). Geological map of Perry County: Scale, 1 inch equals 2 miles, (1881). Pa. Geol. Survey 2nd, F2, in pocket, 1885. A county map is included in the same report with a later, more accurate one.

DE WITT, WALLACE, JR. See also Pepper, James Franklin, 2.

1. The stratigraphic relationship of the Berea, Corry, and Cussewago sandstones in . . . [Crawford County] northwestern Pennsylvania: U. S. Geol. Survey Oil and Gas Inv., Prelim. Chart 21. Map with text, scale, about 1 inch equals 4 miles, 1946. The relations between the formations are shown in cross sections. The Corry sandstone pinches out westward across an arch and the Berea sandstone pinches out westward across the same arch. The Cussewago Formation underlies both but pinches out eastward.

DeWOLF, FRANK WALBRIDGE

1. New Castle quadrangle [Lawrence-Beaver Counties]—geology and mineral resources: Pa. Topog. Geol. Survey 4th ser., Geol. Atlas 5, 238 p., illus. incl.

geol. maps, [1929]. A complete geologic description of the area is given. Pennsylvanian and Pleistocene rocks are at the surface. Much attention is given to the glacial geology. Gentle folds are the chief structure. Sections are measured. Coal, petroleum, and gas are the major economic resources; many minor products are described.

DICKEY, J. B. R.

1. Calcareous marl in Pennsylvania south of the terminal moraine: Pa. Topog. Geol. Survey [4th ser.], Bull. 76, 10 p. (#), illus., 1923. Marl, made of calcium and magnesium carbonate with varying amounts of earthy and organic impurities, is found in many small isolated areas. It could be used locally. Its origin as stream deposits is considered.

DICKEY, PARKE ATHERTON. See also Krynine, Paul Dimitri, 4; Sherrill, Richard Ellis, 7.

1. Oil mining possibilities in Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Prog. Rpt. 123, 31 p., illus., 1939. The general technique is carefully outlined. The possibility of digging shafts down to spent reservoirs and drilling horizontally is described. No specific examples, however, are used from the Commonwealth.
2. Oil geology of the Titusville quadrangle [Warren, Crawford, Venango, and Forest Counties], Pennsylvania: Pa. Geol. Survey 4th ser., M-22, vii, 87 p., illus., 1941. Mississippian-Pennsylvanian rocks are exposed at the surface. Devonian rocks are in the subsurface and contain the petroleum. Well records are generalized; subsurface correlations are made.
3. Electrical well logging in the eastern states: Pa. Topog. Geol. Survey [4th ser.], Prog. Rpt. 129, 30 p., illus., 1942. This is a treatise on the principles of electric logging with examples from the oil fields in the Titusville area.
4. (and Sherrill, Richard Ellis, and Matteson, Lawrence Stanley). Oil and gas geology of the Oil City quadrangle [Venango, Clarion, and Forest Counties], Pennsylvania: Pa. Geol. Survey 4th ser., M-25, vi, 201 p., illus., 1943. A detailed stratigraphic and structural description of the area is given. Devonian-Pennsylvanian rocks are described. The petroleum and gas comes from several sands in the Devonian which are described in detail. The structure consists of anticlines and synclines. Generalized well logs are included, as are some analyses.
5. (and Matteson, Lawrence Stanley). Oil and gas field farm line maps of the Franklin and Oil City quadrangles [Venango, Forest, and Clarion Counties], Pennsylvania: Pa. Geol. Survey 4th ser., Special Bull. 2, (supplement to M-24 and M-25), 18 p., illus., 1945. Property-line maps also include the subsurface distribution of various Devonian and Mississippian sands. Brief descriptions of the rocks are included.
6. (and Heeren, Lillian). Oil and gas field property line maps of the Titusville quadrangle [Crawford, Warren, Venango, and Forest Counties], Pennsylvania: Pa. Geol. Survey 4th ser., Special Bull. 4, (supplement to M-22), illus., 1946. Besides property lines, the subsurface distribution of Devonian-Mississippian sands is included, along with a brief description of them.

DIEFFENBACH, OTTO

1. Das Vorkommen von Chrom-Erzen und ihre Verarbeitung in den Vereinigten Staaten von Nord-Amerika: Neues Jahrb. Mineralogie, Geognosie, u Geol. 1855, p. 533-539, Stuttgart, 1855. This is a general description of the occurrence of [chromite] and iron-bearing chromium compounds from the eastern United States. The Wood mine in Lancaster County is examined also. Kämmererite, rhodochrome, and emerald nickel are present.

DIKE, PAUL A.

1. A preliminary report on the Wissahickon Fm. southwest of Philadelphia [Chester County]: S. P. thesis, Bryn Mawr College, 1949.

DILLER, JOSEPH SILAS, 1850-1928.

1. Recent studies of domestic chromite deposits: Amer. Inst. Mining and Metallurgical Engineers, Bull. 153, p. 1995-2040, illus., 1919; Trans. 63, p. 105-149, illus., 1920. A complete discussion of the origin, distribution, and occurrence of chromite is given. A brief description of the Wood mine in Lancaster County is included. The chromite is associated with serpentine.

DIMMOCK, GEORGE

1. The writings of Samuel Hubbard Scudder [1837-]: Dimmocks Special Bibliography no. 3, 28 p., [priv. pub.], Cambridge, Mass., 1879.

D'INVILLIERS, EDWARD VINCENT. See also Carll, John Franklin, 7; Lesley, J. Peter, 53.

1. The geology of the South Mountain belt of Berks County: Pa. Geol. Survey 2nd, D3, vol. 2, xxii, 441 p., illus. incl. atlas, 1883; rock collection *in* Catalogue of the museum, Part 3; 000, p. 7-18, 1889. The stratigraphy and structure of the Reading Prong are described. [Precambrian]-[Ordovician], and [Triassic] rocks are described. Iron ore is the chief mineral resource which is discussed.
2. Geology of Lehigh Co., Chapter 15 *of* History of the counties of Lehigh and Carbon in the Commonwealth of Pennsylvania, by A. Mathews and A. N. Hungerford: p. 114-119, map, Philadelphia, 1884. "A brief discussion of the geological formations mainly taken from the reports of the 2nd Survey of Pa. Includes analyses of limestones and iron ores. The structure is described as follows: The thickness of the limestone formation in Lehigh County is uncertain, for the apparently regular surface of the valley conceals a very troubled and irregular floor, from three to seven miles wide, so complicated and distorted as to defy accurate measurement or interpretation of dips. Its general structure is a series of tightly compressed rolls and basins, some regular, some overturned, twisted, and even snapped."—B. L. Miller.
3. The brown hematite (limonite) ores of the Siluro-Cambrian limestone, no. II, of Centre Co., Pa.: Engineers Club of Philadelphia, Proc. 4, p. 209-222, 1884. Ore occurs in several ways, as (1) large-scale disintegration of sandy [Cambrian] beds, as (2) amorphous, compact, deep red ore in large pieces, resulting from residual accumulations of the [Ordovician] limestone, and as (3) *pipe ore* in limestone higher in the section. Some individual deposits are described.
4. The geology of Centre County: Pa. Geol. Survey 2nd, T4, p. xviii, 1-351, illus. incl. geol. map. 1884. A complete geologic description of the area is given. [Ordovician]-[Pennsylvanian] rocks are present. The structure is described in detail. Sections are measured; fossils are listed, and analyses are made. Coal and iron ore are the chief economic products.
5. Nittany valley ores [Huntingdon County]: Pa. Geol. Survey 2nd, T3, p. 443-450, 1885. Residual iron-ore deposits are described and evaluated. Certain structural features are also described.
6. Preliminary report of work done in 1855, on the resurvey of the Pittsburgh coal region [Allegheny, Washington, and Westmoreland Counties]: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 125-221, illus., 1886. Elevations of the Pittsburgh coal are given. A series of parallel northeast-southwest anticlines and synclines are outstanding; each is described. [Pennsylvanian] stratigraphy is discussed in detail. Sections are measured.
7. The Cornwall iron-ore mines, Lebanon Co., Pa.: Amer. Inst. Mining Engineers, Trans. 14, p. 873-904, illus., 1886. Triassic dolerite has preserved genetically unrelated magnetite from erosion. The ore is stratified and considered to be originally sedimentary. Sections are measured; analyses are made. Copper is associated.
8. Report on the iron ore mines and limestone quarries of the Cumberland-Lebanon Valley: Pa. Geol. Survey 2nd, Ann. Rpt. 1886, Part 4, p. 1409-1567, illus. incl. geol. maps, 1887. This is a discussion of many iron ore mines in the area. The geology of each is discussed. Analyses are given. The same is done for many limestone quarries in the region. Most iron-ore mines occur along the Blue Ridge in the lower Paleozoic limestone, The ore is residual.
9. Report on the Pittsburgh coal region: Pa. Geol. Survey 2nd, Ann. Rpt. 1886, Part 1, p. 1-372, illus. incl. geol maps, 1887. This is an exhaustive discussion of the geology of that part of southwestern Pennsylvania which is underlain by the Pittsburgh coal. The structure and stratigraphy are discussed in detail. Each county is considered separately.
10. Report on the geology of the four counties, Union, Snyder, Mifflin, and Juniata: Pa. Geol. Survey 2nd, F3, xxiv, 420 p., illus. incl. atlas [includes

Huntingdon County]. 1891. A complete geologic description of the area is given. Ordovician-Devonian rocks are present. The structure is discussed in detail. Iron ore, glass sand, and limestone are the chief economic products. Sections are measured; fossils are listed.

[DISBROW, LEVI]

1. Notice of some recent experiments in boring for fresh water . . .: Amer. Jour. Sci. 12, p. 136-143, 1827; discussion by S. Hepburn, p. 143-144. In a discussion of the first attempts in this country to drill for water, examples are taken from the southeastern part of the Commonwealth, among other places.

DOLBEAR, SAMUEL H.

1. (ed., and others). Industrial minerals and rocks (nonmetallics other than fuels): 1st ed., 1937; 2nd ed., 1156 p., illus., Amer. Inst. Mining and Metallurgical Engineers, New York, 1949. This is a description of the properties and occurrence of 51 economic materials, many of which occur in the Commonwealth. No new data are added.

DORRANCE, MORRIS D.

1. (and Farrell, John Herbert). The geology of the Chestnut Ridge district near Easton [Northampton County], Pennsylvania: E. M. thesis, Lehigh Univ., 1907.

DORSEY, GEORGE EDWIN

1. Stratigraphy and structure of the Newark system in Maryland and its relation to the Newark system of eastern North America [abs.]: Geol. Soc. Amer., Bull. 30, p. 155-157, 1919.

DOSCH, EARL F. See Sharp, Charles Farquharson Stewart, 1.

DOUGLAS, JAMES

1. Biographical notice of Thomas Sterry Hunt [1826-1892]: Amer. Inst. Mining Engineers, Trans. 21, p. 400-411, 1893.

DOWNEY, M. G.

1. Index to location of stone quarries in the United States: U.S. Bur. Mines, Info. Circ. 7187, 9 p. (#), 1941. The Commonwealth is included. Types of stone being quarried in each county are listed, but no details are given.

DRINKER, H. S.

1. . . . mines and works of the Lehigh Zinc Company [Lehigh County]: Amer. Inst. Mining Engineers, Trans. 1, p. 67-75, 1873. A brief generalized description of the occurrence of the ore is included.

DROWN, THOMAS M.

1. Biographical notice of Theodore D[ehon] Rand [1837-1903]: Amer. Inst. Mining Engineers, Trans. 34, p. 695-701, 1904.

DRYDEN, ABRAHAM LINCOLN, JR.

1. (and Bascom, Florence). Physiographic [field] trip southwest of Philadelphia, trip A *of* Geology of Philadelphia area, by E. Watson: Field Conf. of Pa. Geologists, 5th, p. 8-15, illus., [n.p.] [1935]. A mimeographed road itinerary and brief description of the features of the area are given. The various peneplains, berms, and terraces are discussed. Little detail is included.
2. (and Dryden, Clarissa). Stratigraphic importance of heavy mineral studies in the Philadelphia region: Pa. Acad. Sci., Proc. 12, p. 97-103, illus., 1938. Heavy minerals give clues to the sources of the sediments in the area. The Mine Ridge area was part of the source of Triassic sediments. No Precambrian (?) Wissahickon minerals are in the lower Palezoic rocks nearby. The Coastal Plain rocks of New Jersey have few or no Piedmont minerals.
3. (and Dryden, Clarissa). A key to common non-opaque heavy minerals of the eastern Pennsylvania region: Pa. Acad. Sci., Proc. 14, p. 49-54, illus., 1940. A table showing the properties of the common heavy minerals found from various rocks in southeastern Pennsylvania is given. It is intended as a guide for those who are doing heavy mineral studies in the area.
4. (and Dryden, Clarissa). A note on hyacinth zircon in the rocks of the Honeybrook upland [Chester County]: Pa. Acad. Sci., Proc. 15, p. 73-75, illus., 1941. Peculiar zircons are found in the Precambrian rocks of the Honeybrook Uplift and the Reading Prong. Elsewhere they are known only from Precambrian rocks. The age of the rocks in the two areas is considered the same, and probably Precambrian.

5. (and Dryden, Clarissa). Comparative rates of weathering of some common heavy minerals: Jour. Sedimentary Petrology 16, p. 91-96, illus., 1946. Residual and fresh-rock heavy mineral studies are made. The range of resistance to weathering is discussed. Minerals of the Wissahickon schist are used in the study.

DRYDEN, CLARISSA. See Dryden, Abraham Lincoln, Jr., 2, 3, 4, 5.

DUNBAR, CARL OWEN

1. Antennae in *Olenellus getzi* n. sp. [Lancaster County]: Amer. Jour. Sci. 5th ser. 9, p. 303-308, illus., 1925. This trilobite contains well-preserved antennae which are illustrated. It is from the Kinzers shale, and is Lower Cambrian in age.

DUTOIT, ALEXANDER L. See Larsen, Esper Signius, 1.

DYNAN, JOHN L. See Agthe, Fred T., 1.

EARLE, RAYMOND BARTLETT

1. The genesis of certain Paleozoic interbedded iron ore deposits [Union-Snyder Counties]: New York Acad. Sci., Annals 24, p. 115-170, illus., 1914. The Silurian Clinton ores are considered to have formed by the introduction of the ore by ground water flowing through the once-gently dipping strata.

EASTMAN, CHARLES ROCHESTER, 1868-1918.

1. A new species of *Helodus* [Crawford County]: Carnegie Museum. Annals 5, p. 488-489, 1909. *Helodus comptus* teeth from the Waverly sandstone, Mississippian, near Meadville, are described.

EATON, AMOS, 1776-1842.

1. . . . coal formations in the State of New York—in connexion with the great coal beds of Pennsylvania: Albany Inst., Trans. 1, p. 126-130, 1830; Amer. Jour. Sci. 19, p. 21-26, 1830; discussion by D. Thomas, p. 326-328. Bituminous coal is "true coal," and anthracite is coal "destitute of bitumen." The coal of the Commonwealth is very generally described, and its possible extension into New York is considered.
2. Geological prodromus: Amer. Jour. Sci. 17, p. 63-69, 1830. All geologic strata, including those in the Commonwealth, can be put in five analogous series; each series has three similar formations, viz. Carboniferous, Quartzose, and Calcareous. Each is further subdivided.
   1st series [Precambrian]—[Ordovician]
   2nd series [Martinsburg Formation]—[Devonian]
   3rd series [Chemung, Catskill]—[Silurian]
   4th series [Mississippian]—[Devonian]
   5th series [Tertiary]
   The coal is in the second series. The correlations are considerably in error.
3. *Crotalus? reliquus*, or *Arundo? crotaloides* [Susquehanna County]: Amer. Jour. Sci. 20, p. 122-123, illus., 1831. An elongate impression resembling a snake is illustrated from the anthracite coal formation. It could be a plant, the author agrees.
4. The coal beds of Pennsylvania equivalent to the great secondary coal measures of Europe: Amer. Jour. Sci. 23, p. 399-400, 1833. Plants listed from Lackawanna County are similar to coal plants from Europe. This puts the American coals in the [upper Paleozoic].
5. Cherty lime rock, or corniferous lime rock, proposed as a line of reference for state geologists of New York and Pennsylvania: Amer. Jour. Sci. 36, p. 61-71, 198, 1839. The [Onondaga] limestone is demonstrated to be widespread and should be used as a reference to the transition beds from [lower] to [upper Paleozoic].

EATON, HARRY NELSON

1. The geology of South Mountain at the junction of Berks, Lebanon, and Lancaster Cos., Pa.: Ph.D. thesis, Univ. Pittsburgh, 1913; Jour. Geology 20, p. 331-343, illus. incl. geol. map, 1912. This area contains a core of Precambrian gneiss with a ring of Cambrian sandstone around it except on the south where Triassic rocks occur. The area is anticlinal in nature.
2. A giant pothole near Scranton [Lackawanna County], Pa. [abs.]: Science ns 43, p. 399, 1916.
3. Notes on certain conglomeratic structures in limestones in [Centre County] central Pennsylvania: Science ns 49, p. 474, 1919. Fossils are reported from

conglomeratic beds in the Stonehenge and Axemann limestones. The fossils occur as conglomeratic lenses.

4. Some subordinate ridges of Pennsylvania: Jour. Geology 27, p. 121-127, 1919. Attention is called to the fact that many of the ridges in the Valley and Ridge Province are not accordant and that the theory of a Cretaceous or Tertiary peneplain cannot explain them. No alternative is suggested.
5. The present status of the Medina problem in southeastern Pennsylvania [abs.]: Science ns 56, p. 175, 1922.

EBRIGHT, JOHN RICHARD

1. (and Fettke, Charles Reinhard, and Ingham, Albert Irwin). East Fork-Wharton gas field, Potter County, Pennsylvania: Pa. Geol. Survey 4th ser., M-30, 43 p., illus., 1949. Gas occurs in the Oriskany sandstone; anticlinal control is evident. Pennsylvanian-Devonian rocks are described. Well records are included.

ECKEL, EDWIN CLARENCE

1. Cement-rock deposits of the Lehigh district of Pennsylvania and New Jersey: U.S. Geol. Survey, Bull. 225, p. 448-456, 1904. The cement rock, Trenton limestone, lies between the [Martinsburg] and [Beekmantown] Formations. Each is described in detail, the cement rock even more. Details of quarrying, etc., are given.
2. (and others). Cement materials and industry of the United States: U.S. Geol. Survey, Bull. 243, 395 p., illus. incl. geol. maps, 1905. A complete discussion of the industry includes the Commonwealth. The Lehigh district is the most important and is described in detail. The Ordovician limestones are discussed, as is the structure.
3. The mineral-paint ores of Lehigh Gap [Carbon County], Pennsylvania: U.S. Geol. Survey, Bull. 315, p. 435-437, 1907. An impure iron carbonate containing clay and calcium carbonate occurs in the Lower Devonian rocks as a replacement of upper Helderberg limestone. The ore is described and analyzed.
4. Portland cement materials and industry in the United States: U.S. Geol. Survey, Bull. 522, 401 p., illus. incl. geol. maps, 1913. A complete description of the industry is given, which includes a discussion of the resources of the Commonwealth. The Lehigh district is the biggest source of materials. The geology is briefly described.

EDMUNDSON, RAYMOND SMITH. See Nelson, Wilbur Armistead, 2.

EDWARDS, TIMOTHY

1. A description of a horn or bone lately found in the River Chemung or Tyoga [Tioga County] . . . : Amer. Acad. Arts and Sci., Mem. 2, p. 164-165, 1793. A bone of uncertain origin [probably a mammal] is described. It is a femur six feet long and twenty-one inches in diameter.

EHLERS, GEORGE MARION

1. A new eurypterid from the Upper Devonian of [McKean County] Pennsylvania: Mich. Univ. Museum Paleontology, Contrib. 4, 291-295, illus., 1935. *Eurypterus arnoldi,* new, is described from Chemung beds. Fish scales and plant fragments are associated.

EHRENFELD, C. H.

1. Fluorite from York [York County], Pa.: Jour. Anal. Applied Chem. 4, p. 281, 1890. Fluorite occurs associated with small rhombs of calcite in limestone.
2. Note on stilbite from York Haven, York County, Pa.: Jour. Anal. Applied Chem. 4, p. 157, 1890. Stilbite from granite is described and analyzed.
3. Minerals from York Haven, York County, Pa.: Jour. Anal. Applied Chem. 7, p. 4-5, 1893. Weathered stilbite, chabazite, augite, and sphalerite are mentioned and analyzed.

EHRENFELD, FREDERICK. See also Brown, Amos Peaslee, 5; Watson, Edward Hahn, 2.

1. A study of the igneous rocks at York Haven and Stony Brook [York County], Pennsylvania: Thesis, Univ. Pennsylvania, 24 p., 1898.
2. Factors in the determination of Pleistocene sedimentation in the Philadelphia [Philadelphia County] area [abs.]: Geol. Soc. Amer., Proc. 1934, p. 444, 1935.

ELLER, EUGENE RUDOLPH. See also Williams, Henry Shaler, 3.

1. A new xiphosuran, *Euproops morani,* from the Upper Devonian of [Warren

County] Pennsylvania: Carnegie Museum, Annals 27, p. 151-153, illus., 1938. The specimen is from the Salamanca sandstone north of North Warren. It is described and illustrated.

2. *Belinurus carteri*, a new xiphosuran from the Upper Devonian of [McKean County] Pennsylvania: Carnegie Museum, Annals 28, p. 133-136, illus., 1940. The specimen is from the lower Cattaraugus beds, just south of Bradford. It is described and illustrated.

EMERSON, BENJAMIN KENDALL

1. (and others). Honors to James Hall [1811-] at Buffalo: Science ns 4, p. 697-717, port., 1896.

EMERY, ALDEN H.

1. (and DeChicchis, R.). A survey of some Coal-Measures shales of western Pennsylvania, Part 2 *of* Quantitative mineralogical analysis of rock-dusting materials. . . .: Carnegie Inst. Tech., Mining and Metallurgical Inv., Bull. 21, p. 43-55, 1925. Petrographical analyses of shales associated with coal beds are given.

EMERY, BOYD

1. Geology, *in* Report of the Washington County Medical Society: Medical Soc. Pa., Trans. ns 2, p. 189-190, 1857. A section of [Pennsylvanian] rocks is listed, with no details.

ENGEL, J. A. See Whitcomb, Lawrence, 4.

ERB, E. S. See Frear, William, 3.

EVANS, E. W.

1. On the action of oil wells [Venango County]: Amer. Jour. Sci. 2nd ser. 38, p. 159-166, 1864. In explaining the relationships of oil and gas, examples are taken in part from the Oil Creek area. Gas escapes cyclically from the buildup and release of pressure.

EVANS, LEWIS

1. Analysis of a map of the British Colonies in America: Philadelphia, 1755, [not seen, see Bascom, F., U. S. Geol. Survey, Bull. 136, 1896].

EWING, A. L.

1. Observations on the geological formations nos. II, III, IV, V, VI, VII, VIII, in Center County: Pa. Geol. Survey 2nd, T4, p. 401-434, illus., 1884. Ordovician Trenton limestone is discussed in detail, as is the structure of the county. The formations above this are not described in such detail. Fossils are listed.

2. On the chemical erosion of the Nittany Valley [Centre County] limestone: Pa. Geol. Survey 2nd, T3, p. 451-454, 1885; Amer. Jour. Sci. 3rd ser. 29, p. 29-31, 1885. Stream discharges and salt content are measured, as are drainage basin sizes. By calculation of volumes of material and streams, 1,000,000 years is estimated for the formation of Nittany Valley.

EWING, WILLIAM MAURICE

1. (and Pentz, H. H.). Magnetic survey in the Lehigh Valley [Northampton County]: Amer. Geophysical Union, Trans. [17] Part 1, p. 186-191 (#), illus., 1936. A gravity map reveals a large anomaly which is probably due to a concentration of magnetite in the basement. It is near a place where a seismic anomaly had been detected.

2. Seismic study of Lehigh Valley [Northampton County] limestones: Pa. Acad. Sci., Proc. 10, p. 72-75, illus., 1936. A fault zone is theorized from a slow-speed seismic zone which has been detected by refraction shooting. An east-west magnetic anomaly in the region of the proposed fault is also present.

EYERMAN, JOHN

1. Notes on geology and mineralogy: Acad. Nat. Sci. Phila., Proc. [41] 1889, p. 32-35, 1889. Many descriptions of mineral varieties and locations are given. No data are given except locations.

2. On the mineralogy of the French Creek mines [Chester County] in Pennsylvania: New York Acad. Sci., Trans. 8, p. 56-59, 1889. The mines are on a granite-augite dike which has invaded the Triassic clastic rocks of the region. Seventeen minerals are listed from the region, and some are described in detail.

3. The mineralogy of Pennsylvania—Part 1, to be used as a supplement to Dr. F. A. Genth's Preliminary report on the mineralogy of Pennsylvania, 1875:

54 p., Easton, Pa., 1889; Part 2, Chemical analyses: 25 p. illus., Easton, Pa., 1911; [also *as* Contributions to the mineralogy of Pennsylvania, Part 8]. Over a hundred minerals are described and analyzed from within the Commonwealth. Most are in the southeastern counties, however.

4. A catalogue of the paleontological publications of Joseph Leidy [1823-1891]: Amer. Geologist 8, p. 333-342, 1891.
5. Preliminary notice of some minerals from the serpentine belt, near Easton [Northampton County], Pa.: Acad. Nat. Sci. Phila., Proc. [51] 1891, p. 464-465, 1892. Ten minerals are described from the contact of the serpentine rocks and the [Cambro-Ordovician] limestone. Topaz, hydro-magnesite, chalcopyrite, and graphite are the most important.
6. Contributions to [Northampton County] mineralogy: Amer. Geologist 34, p. 43-48, 1904. Many minerals occur along the serpentine-syenite ridge where it is adjacent to limestone. Among the more common ones are: orthoclase, tourmaline, biotite, prochlorite, amphibole, and serpentine. Analyses are given. Garnet is described from Delaware County, as is a zeolite from Chester County.
7. Contributions to the mineralogy of Pennsylvania [Part] 5: 7 p., Easton [n.d. 1911?] [not seen, see Miller, B. L., Northampton County, 1939, p. 40].

FACKENTHAL, BENJAMIN FRANKLIN, JR.

1. Ringing rocks of Bridgeton township, Bucks County, Pennsylvania: Bucks County Hist. Soc., Papers 5, p. 212-221, illus., 1932. A popular account of a boulder field composed of Triassic diabase is given. They are very dense and "ring" when struck by a hammer.

FAIRCHILD, HERMAN LEROY. See also Cooper, Theodore, 1; Wright, George Frederick, 13.

1. A memoir of Professor John Strong Newberry [1822-1892]: New York Acad. Sci., Trans. 12, p. 152-173, port., 1893.
2. Memoir of Israel C[harles] White [1848-1927]: Geol. Soc. Amer., Bull. 39, p. 126-145, port., 1928.

FAIRCHILD, JOHN GIFFORD. See Wells, Roger Clark, 1.

FARRELL, JOHN HERBERT. See Dorrance, Morris D., 1.

FARRINGTON, OLIVER CUMMINGS

1. A new [York County] Pennsylvania meteorite: Amer. Jour. Sci. 4th ser. 29, p. 350-352, illus., 1910. An iron meteorite is described and analyzed. It fell near Shrewsbury, York County. The main mass weighs 24 pounds; many fragments are known.

FARY, RAYMOND W., JR.

1. An X-Ray study of the Bradford Third and Haskell sands of McKean County, Pennsylvania: M.A. thesis, Washington Univ. St. Louis, 1948.

FAUX, F. R.

1. Aragonite at Allentown [Lehigh County], Pa.: Rocks and Minerals 10, p. 174, 1935. A cave was uncovered in [Ordovician?] limestone which contained much aragonite. The cave was being quarried away at the time.

FAY, ALBERT H. See Plank, William B., 1.

FEATHERSTONHAUGH, GEORGE WILLIAM, 1780-1866.

1. *Rhinoceroides alleghaniensis* [Somerset County]: Monthly Amer. Jour. Geology 1, p. 10-12, illus., 1831. A rhinoceros-jaw fragment containing two teeth is described and illustrated from a soil zone above Turkey Foot. "The superficial soil reposes on [Mississippian] grit." Its antiquity is not considered, however.

FEATHERSTONHAUGH, J. D.

1. Memoir of Mr. G[eorge] W[illiam] Featherstonhaugh [1780-1866]: Amer. Geologist 3, p. 217-223, port., 1889.

FELLOWS, ROBERT ELLSWORTH

1. Recrystallization and flowage in Appalachian quartzite: Thesis, Johns Hopkins Univ., 1943; Geol. Soc. Amer., Bull. 54, p. 1399-1432, illus., 1943. Quartz deformation from Appalachian folding is divided into five classes: original grains, peripheral growth, crushed, needle, and recrystallized. Each indicates a particular degree of deformation, from none to most. Visible limits of deformation are determined stratigraphically and geographically. Fabric diagrams are given.

FENNEMAN, NEVILLE MELANCTHON

1. Physiographic divisions of the United States: Assoc. Amer. Geog., Annals 6, p. 19-98, illus., 1916; [2nd ed. reprinted 1921]; 3rd ed., revised and enlarged, 18, p. 261-353, illus., 1928. A physiographic review of the United States includes the Commonwealth.
2. Physiography of the eastern United States: xiii, 714 p., illus. incl. geol. maps, New York, McGraw-Hill, 1938. An extremely detailed description of the eastern physiographic provinces includes the Commonwealth. The origin of the features is also given.

FENTON, CARROLL LANE

1. (and Fenton, Mildred Adams). Cambrian calcareous algae from Pennsylvania: Amer. Midland Naturalist 18, p. 435-441, illus., 1937. Algae from Cambrian limestones in Bucks, Northampton, Centre, and Berks Counties are illustrated. They are partly dolomitized, and their mode of formation is not evident. Most are from the Allentown and Hoyt limestones.

FENTON, MILDRED ADAMS. See Fenton, Carroll Lane, 1.

FERGUSON, EDWARD G. W.

1. Peach Bottom slate deposits [York County] Pennsylvania: Mining World 33, p. 183-184, illus., 1910. The conditions of occurrence, composition, structure, and economics of this deposit are reviewed.

FERM, JOHN C.

1. Cyclothems of the upper Allegheny and basal Conemaugh groups near Brookville, Jefferson County, Pennsylvania: M.S. thesis, Penn. State College, 1948.

FETTKE, CHARLES REINHARD. See also Ashley, George Hall, 26; Barb, Clark Fred, 1; Ebright, John Richard, 1; Newby, Jerry B., 1.

1. The glass sands of Pennsylvania: Science ns 48, p. 98-100, 1918. The characteristics of glass sand are described. The Oriskany Formation is the major source, although some of the sands in the Pottsville Formation are also used. Little detail is given.
2. Glass manufacture and the glass sand industry of Pennsylvania: Pa. Topog. Geol. Survey [~~4th~~ ser.], Rpt. 12, 278 p., illus., 1918 [1919]. A complete description of the industry in the Commonwealth is given. The Oriskany Formation is the most important source of sand, and the Pottsville Formation also is used but less extensively. Various localities are described.
3. Oil from Pennsylvania shales and coals—(preliminary report): Pa. Topog. Geol. Survey [4th ser.], Bull. 18, 15 p. (#), 1921. The Commonwealth is not well supplied with oil shale and oil-bearing coal. Only the coal in the extreme west and northwest contains petroleum products. Analyses are made from various parts of the Commonwealth. There seems to be a positive relationship to the tectonics, but otherwise no geological data are included.
4. Cannel coal and carbonaceous shale deposits of Pennsylvania: Amer. Inst. Mining and Metallurgical Engineers, Trans. 69, p. 1167-1179, illus., 1923; discussions, p. 1179-1181. Cannel coal, its properties and occurrence, is described. It comes almost entirely from Pennsylvanian rocks. One occurrence is in Permian rocks. The most important deposits are described. The major sources are: (1) the Upper Freeport coal in Allegheny County, (2) the Upper Kittanning coal near Cannelton, Beaver County, and (3) the Upper Kittanning coal in Armstrong County.
5. Oil resources in coal and carbonaceous shales of Pennsylvania: vi, 119 p., illus., Pa. Geol. Survey 4th, 1923. Coal, cannel coal, and carbonaceous shale are sources of oil in the Commonwealth. There is much coal available, and it is described by county. Carbonaceous shale is present in Devonian-Permian rocks, but none is economic. Only one occurrence of cannel coal is economic.
6. (and Hill, E. G.). Vanport limestone of Butler and southern Venango Counties, *in* Limestones of Pennsylvania by B. L. Miller: Pa. Geol. Survey 4th ser., M 7, p. 282-292, 1925. The Vanport limestone is described in detail from many outcrops. Various quarries are described. Its uses are listed, and it is analyzed.
7. Physical characteristics of the Oriskany sandstone and subsurface studies in the Tioga gas field [Tioga County], Pennsylvania: Pa. Geol. Survey [4th ser.], Bull. 102-B, p. 1-9 (#), 1931. The upper part of the Oriskany sandstone is the reservoir rock in the area. Porosity analyses are made; thickness figures

are determined. It is about ten percent porous and about fifty feet thick. A detailed log shows the Silurian-Devonian rocks in the area.

8. Subsurface Devonian and Silurian sections across northern Pennsylvania and southern New York: Geol. Soc. Amer., Bull. 44, p. 601-660, illus., 1933. Twelve well-logs are given in detail, which include rocks from the Chemung Formation down to the Queenston shale. The Devonian-Mississippian boundary is not clearly defined. The Oriskany sandstone rests on a thick Salina section in places. An unconformity is suggested.
9. [Geology of] Beaver Valley [field] trip, trip no. 2: Field Conf. of Pa. Geologists, 4th, 2 p. (#) [Pittsburgh?], 1934. A mimeographed road log of a trip along the Beaver Valley to Beaver County is given. No details are included.
10. Physical characteristics of Bradford sand, Bradford field [McKean County], Pennsylvania, and its relation to production of oil: Amer. Assoc. Petroleum Geologists, Bull. 18, p. 191-211, illus., 1934. A complete petrologic description of the sand is given. It is in the Chemung group. It is in two anticlines trending northeast-southwest. The sand is predominantly quartz. A little mica and feldspar are present. Extensive porosity and permeability studies are made. The oil is associated with the thick-sand areas. The structure also contributes to the accumulation of oil.
11. Gas and oil possibilities of Oriskany sandstone, northwest Pennsylvania: Oil and Gas Jour. 33, no. 37, p. 113-114, illus., 1935. The presence, stratigraphy, lithology, and production possibilities of a sand at the Oriskany level is discussed.
12. (and Cathcart, Stanley Holman). Geology and possibility of deep-sand oil and gas production in northwestern Pennsylvania: Pa. State College Mineral Industry Experiment Sta., Bull. 19, p. 91-122, illus., 1935. The Ordovician-Pennsylvanian section is described with much emphasis on the Ordovician and Silurian beds as possible reservoirs.
13. (and Cathcart, Stanley Holman). Possibility of deep production in northwestern Pennsylvania: Oil and Gas Jour. 33, no. 50, p. 19-20, 38-39, illus., 1935; no. 51, p. 57, 59-61, illus., 1935. A detailed review of the stratigraphy and structure of the rocks below the Upper Devonian and above the Cambrian. Many columnar and cross sections are used.
14. Subsurface stratigraphy of northwestern Pennsylvania and a resumé of gas and oil possibilities of deeper sands: Pa. Topog. Geol. Survey [4th ser.], Bull, 114, 23 p. (#), illus., 1935. Silurian-Devonian rocks are described from wells. The Devonian-Mississippian boundary is discussed. The section thickens southeastward, especially the Salina, Portage, and Chemung groups. The Oriskany, Salina, Lockport, and Medina Formations are possible reservoir rocks.
15. Subsurface stratigraphy of the northern Appalachian plateau province [abs.]: Geol. Soc. Amer., Proc. 1934, p. 445-446, 1935.
16. Geology and oil resources of the Bradford field [McKean County], Pennsylvania and New York (preliminary report): Pa. Topog. Geol. Survey [4th ser.], Bull. 116, 13 p. (#), illus., 1937. Devonian-Pennsylvanian rocks are described. All the production is from Upper Devonian sands, and the Bradford Third sand is chief among these. Anticlines cause the traps.
17. [Geology of the Bradford district, Tioga County]: Field Conf. of Pa. Geologists, 7th, 11 p. (#), [n.p.] 1937; [Part 2] 8 p. (#) illus., [n.p.] 1937. This is a mimeographed guidebook. Devonian-Pennsylvanian stratigraphy is described and visited. No details are included.
18. Physical characteristics of the Bradford third sand and relation to occurrence of oil: Oil and Gas Jour. 36, no. 12, p. 20-22, 24-25, 35, illus., 1937. Petrographic details are given, along with an interpretation of the sedimentary conditions.
19. Oriskany as a source of gas and oil in Pennsylvania and adjacent areas: Amer. Assoc. Petroleum Geologists, Bull. 22, p. 241-266, illus., 1938. The areal distribution, thickness, and physical characteristics of the Oriskany Formation described. Most of the production is from domes in north-central Pennsylvania which are described. No oil is known. Connate-water analyses are given. The hydrocarbon-metamorphism ratio is discussed, as are reserves.

20. The Bradford oil field [McKean County], Pennsylvania and New York: Pa. Geol. Survey 4th ser., M 21, xvii, 454 p., illus. incl. geol. map, 1938. Upper Devonian-Pennsylvanian, and Quaternary rocks are at the surface. Middle and Upper Devonian rocks are correlated by many wells. The Bradford sandstone in the Chemung group is the biggest producer. It is described in detail. The thickness of the sand controls the presence of the oil. It is present where the sand is thick. There is structural control also. Some of the minor fields nearby are described. The ground water is also discussed.
21. Subsurface stratigraphy of western Pennsylvania [abs.]: Geol. Soc. Amer., Bull. p. 1978-1979, 1939.
22. Subsurface studies in connection with deep oil and gas explorations in [western] Pennsylvania: Pa. State College Mineral Industry Experiment Sta., Bull. 30, p. 34-51, illus., 1940; discussion by R. E. Sherrill, p. 51-52. The subsurface extent and nature of Ordovician, Silurian, and Lower Devonian beds are discussed. The oil- and gas-bearing possibilities are also discussed.
23. Summitt gas pool, Fayette County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Prog. Rpt. 124, 21 p., illus., 1940; Pa. Geol. Survey 4th ser., C 26, p. 436-441, illus., 1940. Gas comes from a dome on the Chestnut Ridge in the Devonian Onondaga limestone. Six wells are producing. Generalized well logs are given.
24. Music Mountain oil pool, and other oil pools in Lafayette Township, McKean County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Prog. Rpt. 125, 34 p., illus., 1941. Mississippian-Pennsylvanian rocks are at the surface. The Devonian is described from well logs. The structure is an anticline, and production comes from various Devonian sand lenses. Well-correlations are made. Each sand and each pool is discussed in detail.
25. Music Mountain oil pool, McKean County, Pennsylvania, *in* Stratigraphic type oil fields, by A. I. Levorsen, ed.: p. 492-506, illus., Amer. Assoc. Petroleum Geologists, Tulsa, 1941. The pool is in a "shoestring" sand four miles long and 800-2000 feet wide; it is probably an offshore bar. The Sliverville sand is in the Upper Devonian, above the Bradford sand. It is on the flank of the Bradford anticline. The sand characteristics are described.
26. Subsurface sections across western Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Prog. Rpt. 127, 51 p., illus., 1941. Nine detailed well logs are given. They range from Ordovician to Pennsylvanian. Those which could be reservoirs are discussed. The section thickens considerably eastward.
27. (and Bayles, Robert Ellery). Conemaugh Gorge section of the Mississippian System southeast of Cramer [Indiana County], Pennsylvania: Pa. Acad. Sci., Proc. 19, p. 86-95, illus., 1945. A detailed section is given and compared with other sections in southwestern Pennsylvania.
28. (and Siefert, Wilbur H.). Haskell sand core from the Coryville pool, McKean County, Pennsylvania (preliminary report): Pa. Topog. Geol. Survey [4th ser.], Prog. Rpt. 131, 9 p. (#), illus., 1946. A very detailed description of about fifty feet of core in the Devonian sand is given.
29. (and Stephenson, Robert Charles and Tignor, E. M.). Oil and gas developments in the North Strabane area, Washington County, Pennsylvania: Pa. Geol. Survey 4th ser., M 28, vi, 62 p., illus., 1946. A geologic description of the area includes structure and stratigraphy of the rocks of Devonian-Permian age; all are completely subsurface. Well data are tabulated.
30. Subsurface Trenton and sub-Trenton rocks in . . . Pennsylvania . . . , *in* Appalachian Basin Ordovician symposium, by J. T. Gayley, ed.: Amer. Assoc. Petroleum Geologists, Bull. 32, p. 1457-1492, illus., 1948; reprinted *as* Pa. Geol. Survey 4th ser., G 21, 1948. Outcrops and six well records show the Cambro-Ordovician rocks in Pennsylvania and adjacent areas; detailed sections result. An unconformity is present within the Ordovician. The structure is an asymmetrical synclinorium. Reverse faults are evident.

FIELD, RICHARD MONTGOMERY

1. Intraformational structure in the Ordovician limestone of central Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 28, p. 166-167, 1917; discussion by A. W. Grabau, p. 167.

2. The Middle Ordovician of central and south central Pennsylvania: Amer. Jour. Sci. 4th ser. 48, p. 403-428, illus., 1919. Nine sections are measured. The formations described, from bottom to top are: (1) Loysburg Formation, (2) Carlim Formation, (3) Valentine Formation, (4) Center Hall Formation, (5) Rodman Formation, (6) Salona Formation, and (7) Coburn Formation. Fossils are listed; analyses are made.
3. Ordovician sections of Great Britain and American equivalents [abs.]: Geol. Soc. Amer., Bull. 42, p. 220-221, 1931.

FIELDNER, ARNO CARL

1. (and Selvig, Walter A., and Paul, W. J.). Analyses of mine and car samples of coal collected in the fiscal year 1916 to 1919: U. S. Bur. Mines, Bull. 193, 391 p., illus., 1922. Proximate and ultimate analyses of many coals are made, including many from the Commonwealth.
2. (and others). Analyses of mine samples, *in* Coal Analyses—Part 4 *of* Bituminous coal fields of Pennsylvania, introductory volume: Pa. Geol. Survey 4th ser., [M 6], p. 13-256, 1925; 2nd ed., revised, 1928. Analyses are tabulated and arranged geographically with respect to county and towns. Proximate, ultimate, and calorific values are determined.
3. (and others). Carbonizing properties and constitution of Pittsburgh bed coal from Edenborn mine, Fayette County, Pa.: U. S. Bur. Mines, Tech. Paper 525, 60 p., illus., 1932. Included are very detailed petrographic analyses of the coal. Polished sections are described.
4. (and others). Carbonizing properties and petrographic composition of Pittsburgh bed coal from Pittsburgh Terminal no. 9 mine, Washington County, Pa.: U. S. Bur. Mines, Tech. Paper 571, ii, 33 p., illus., 1936. Included is a brief geologic description of the coal bed and a very detailed petrographic analysis.
5. (and others). Carbonizing properties and petrographic composition of Pittsburgh-bed coal from Bureau of Mines experimental mine Bruceton. Among County, Pa.: U. S. Bur. Mines, Tech. Paper 594, iv, 43 p., illus., 1939. Among other properties, a chemical analysis and petrographic study are made. Two layers result; the bottom is bright, and the top is mixed bright and splint.
6. (and others). Carbonizing properties and petrographic composition of washed and unwashed Lower and Upper Kittanning bed coals from mines 72 and 73, Johnstown, Cambria County, Pa.: U. S. Bur. Mines, Tech. Paper 595, iv, 81 p., 1939. Among others, proximate and ultimate analyses are made, and a petrographic description is given.

FINCH, ELMER HARRISON

1. Glaciation of the Elk Hills of [Susquehanna County] Pennsylvania: Pan-Amer. Geologist 72, p. 349-354, 1939. Erratics, and other glacial phenomena are examined, analyzed, and interpreted so that glacial ice did not cover the hills as White (1881) suggested. The soils are considered residual and not glacial.

FINCH, I.

1. Travels in the United States of America and Canada . . . and notices of the geology and mineralogy: 455 p., London, 1833. An occasional reference is made to the geology around Philadelphia, Easton, and the coal regions. Little detail is given.

FINCH, JOHN

1. . . . geology of the country near Easton [Northampton County], Pennsylvania: Amer. Jour. Sci. 8, p. 236-240, illus. incl. geol. map, 1824. "Gives a short description of the 'Sienitic range of the Lehigh' listing 13 minerals; the 'sienite' serpentine and steatite of Chestnut Hill listing 31 minerals; the 'transition limestone' listing 7 minerals; and the 'diluvial formation' listing 4 minerals. Says that slate quarries have been opened in the 'transition clay slate near the banks of the Delaware' but the product is inferior."—B. L. Miller.
2. Memoir on the New, or varigated sandstone of the United States: Amer. Jour. Sci. 10, p. 209-212, illus., 1826. The [Triassic] rocks of the Commonwealth are considered as equivalent to those of Connecticut and not part of the [Devonian] as mapped at that time.
3. On the geology and mineralogy of the country near West Chester [Chester County], Pa.: Amer. Jour. Sci. 14, p. 15-18, 1828. An extremely generalized

description of the major rock types in the area is given. They are briefly described; little is said or known of their stratigraphy. Mineral localities are given.

FINN, FENTON HARRISON

1. Geology and occurrence of natural gas in Oriskany sandstone in Pennsylvania and New York: Amer. Assoc. Petroleum Geologists, Bull. 33, p. 303-335, illus., 1949. Gas occurs in structural and stratigraphic traps, most of the reserves being in the latter. Early regional conditions were important. Structures seem to have had some effect on sand conditions. Domes and thrust faults have trapped most of the gas in the north.

FISCHER, LLOYD W.

1. The Helderberg limestone of Pennsylvania: M.S. thesis, Penn. State College, 1923.

FISHER, L. E.

1. Chromite, its paragenesis, mineral and chemical composition: Thesis, John Hopkins Univ., 1929.

FISHER, ROBERT ALLAN

1. Isopachous maps of the Appalachian geosyncline: A.B. thesis, Univ. Illinois, 1941.

FISHER, SAMUEL B.

1. Map of the first and second anthracite coal fields: Scale, 1 inch equals 200 perches, Pottsville, 1836.

FITCH, WILLIAM EDWARD

1. Mineral waters of the United States and American spas: 799 p., illus., Lea & Febiger, Philadelphia, 1927. A list of springs and the analyses of many of them are given for the Commonwealth as well as other states.

FLINT, RICHARD FOSTER

1. (and others). Glacial map of North America—Part 1, 2 sheets; —Part 2, Bibliography and explanatory notes: Geol. Soc. Amer., Special Paper 60. viii, 37 p., geol. map, 1945. A small-scale map shows the distribution of glacial deposits of North America. The Commonwealth is included. The text shows the origin of the data which are mapped.

FLOWER, ROUSSEAU HAYNER. See also Miller, Arthur Keith, 1.

1. (and Caster, Kenneth Edward). The stratigraphy and paleontology of northwestern Pennsylvania—Part 2, Paleontology, section A. The cephalopod fauna of the Conewango group of the Upper Devonian in New York and Pennsylvania: Bull. Amer. Paleontology 22, no. 75, p. 199-270, illus., 1935. Paleontologic descriptions of twenty-five nautiloid species and one ammonoid are given. Many are new.
2. Devonian brevicones of New York and adjacent areas: Paleontographica Americana 2, no. 9, 84 p., illus., 1938. *Pachtoceras obliquum* from the Lewis Run sandstone [Bradford County], is described and illustrated.
3. Study of the Pseudorthoceratidae: Paleontographica Americana 2, no. 10, 214 p., illus., 1939. Included in this monograph are *Bradfordoceras transversum*, *B. moderatum*, *B. giganteum*, and *B. fusiforme* from the Devonian Lewis Run sandstone in Bradford County. They are described and illustrated.

FLUCK, FRANK

1. Lower Coal Measures of central Pennsylvania: Mines and Minerals 24, p. 574, illus., 1904. A few generalizations are presented about the characteristics of the coal seams. The variation in seam thickness, discontinuity, and variation in thickness of strata between coal beds are mentioned. Examples are taken from the Broad Top field.

FOERSTE, AUGUST FREDERICK

1. New fossil localities in the early Paleozoics of Pennsylvania . . .: Amer. Jour. Sci. 3rd ser. 46, p. 435-444, illus., 1893. *Olenellus* in the [Hardyston] sandstone in New Jersey indicates a Cambrian age. The rock can be traced into Pennsylvania on the Reading Prong. The [Cambro-Ordovician] section is generalized and related stratigraphically and physically to rocks in Vermont which have fossils as Cambrian age indicators.
2. A restudy of some of the Ordovician and Silurian cephalopods described by Hall: Denison Univ., [Bull. 38, no. 8] Science Lab., Jour. 23, p. 173-230, illus.,

1928. In a monographic-type work, *Cyrtorizoceras sp.* from the Ordovician near Carlisle, Cumberland County, is described.

FOLK, ROBERT LOUIS

1. Petrography and reservoir potentialities of the Nittany dolomite [Centre County]: Pa. State College Mineral Industry Experiment Sta., Bull. 52, p. 43-52, illus., 1949; Producers Monthly 13, no. 7, p. 35-38, illus., 1949. The most important type of porosity is the intergranular type. Vugs and joints are also present. Detailed lithologic descriptions of the rock are given.
2. Petrology of lower Ordovician cherts in central Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 60, p. 1969, 1949.

FONTAINE, WILLIAM MORRIS. See also Wanner, Atreus, 3.

1. (and White, Israel Charles). The Permian or Upper Carboniferous flora of West Virginia and southwestern Pennsylvania: Pa. Geol. Survey 2nd, PP, ix, 143 p., illus., 1880. A detailed description of the flora of the Permian includes a brief description of the sediments. The species of 24 genera are described.

FOOSE, RICHARD MARTIN. See also Graeber, Charles Karsner, 3; Meyerhoff, Howard Augustus, 7; Sampson, Edward, 1; Ulmer, L. J., 1.

1. Structural relations of Kittatinny and Little Mountains north of Harrisburg [Dauphin County], Pa.: Pa. Acad. Sci., Proc. 13, p. 144-149, illus., 1939. The structural relation of Kittatinny and Little Mountains is complex. Faulting has modified the primary folded structure. The trend of ridge crests has been altered and stratigraphic succession disturbed. Erosion becomes significant. The topography closely reflects the structure.
2. (and Barnes, Harley, Jr.). The geology of Kittatinny and Little Mountains, north of Harrisburg [Dauphin County], Pennsylvania: M.A. thesis, Northwestern Univ., 1939.
3. A cross syncline structure near Lock Haven [Clinton County], Pennsylvania: Pa. Acad. Sci., Proc. 14, p. 64-68, illus., 1940. A syncline crosses the Nittany arch at an angle less than 90 degrees to the axis of the arch. This is uncommon and is explained by an application of different forces than those commonly considered in the Appalachians.
4. Underground waters abound in Conshohocken [Montgomery County] area: Pa. Dept. Internal Affairs, Monthly Bull. 8, no. 3, p. 8-10, 1940. The sink holes and springs in the area are attributed to underground water derived from the Schuylkill River.
5. The Brookville coal at Brookville [Jefferson County], Pennsylvania: Pa. Acad. Sci., Proc. 15, p. 107-111, illus., 1941. The stratigraphic position of the Brookville coal at the base of the Allegheny group is studied. Its correlation with the Mercer group is considered. Sections are measured.
6. Geological history of mineral resources of Lancaster [County]: Pa. Dept. Internal Affairs, Monthly Bull. 10, no. 6, p. 3-10, illus., 1942. A generalized, popular description of the mineral resources of the county is given.
7. Manganese mineralization in Pennsylvania: Pa. Acad. Sci., Proc. 16, p. 76-81, 1942. Manganese occurs in the Commonwealth as a sedimentary deposit, hypogenically, and as supergene deposits. Several examples are given in various locations and various parts of the section.
8. Manganese minerals of Pennsylvania: Ph.D. thesis, Johns Hopkins Univ., 1942; Pa. Topog. Geol. Survey [4th ser.], Prog. Rpt. 128, 22 p., illus. incl. geol. maps, 1942; Pa. Geol. Survey 4th ser. M 27, ix, 130 p., illus. incl. geol. maps, 1945. Lists and descriptions of manganese minerals are given. Types of deposits are discussed. The distribution of the major ore bodies and of manganese by counties is given. Maps of Sherman Valley and Reading Banks deposits are included.
9. Growth of iron oxide stalactites [Cumberland County]: Pa. Acad. Sci., Proc. 17, p. 26-29, illus., 1943. Iron oxide has formed stalactites in clay cavities by concentric colloform growth. Radial fracturing indicates shrinking during solidification.
10. Geology and mineral resources in war [Part 1]: Pa. Dept. Internal Affairs, Monthly Bull. 12, no. 7, p. 12-15, 1944; Part 2, no. 8, p. 20-24, 1944. A popular

account of the role played by geology in war-material accumulation is given. The part of the Commonwealth is considered as an example.

11. Mining and treatment of clay near Mt. Holly Springs [Cumberland County], Pennsylvania: Amer. Inst. Mining and Metallurgical Engineers, Tech. Pub. 1655, 4 p., illus., 1944. The Antietam quartzite overlies the Montalto quartzite and underlies the Tomstown dolomite; all are Cambrian. White clay results from the residual accumulation of the weathered top part of the Antietam.
12. Secondary structures of an asymmetric syncline near Everett [Bedford County], Pennsylvania: Pa. Acad. Sci., Proc. 18, p. 54-62, illus., 1944. A study of many joints and cleavage planes in the Mauch Chunk shale and Pocono sandstone shows relationships between the primary and secondary structures which indicate that the former influence the latter.
13. High-alumina clays of [Clearfield County] Pennsylvania: Economic Geology 39, p. 557-577, illus., 1945. Clay, associated with the Mercer coal of the Pottsville is flint- and diaspore-bearing flint clay, with gradations between flint clay and pure diaspore. The diaspore occurs as nodules in the under clay of the Mercer. The distribution is sporadic; it was probably influenced by the underlying eroded surface of the Connoquenessing sandstone. The origin is due to leaching of silica from flint clay and partly by addition of alumina to the flint clay.
14. Iron-manganese ore deposit at White Rocks, Cumberland County, Pennsylvania: Pa. Geol. Survey 4th ser., M-26, v, 35 p., illus. incl. geol. map, 1945. Iron and manganese oxide minerals occur as nodules in residual clay of the Tomstown dolomite. Limonite occurred in the fissures and manganese minerals have replaced the limonite in part.
15. Iron ores of the Cumberland Valley and their future: Pa. Dept. Internal Affairs, Monthly Bull. 13, no. 5, p. 3-13, illus., 1945. A popular account of the iron ores occurring as residual deposits in the Cambro-Ordovician limestones is given. The future is good.
16. Diaspore clay in Clinton County, Pennsylvania: Pa. Acad. Sci., Proc. 20, p. 75-82, illus., 1946. Diaspore occurs in Pennsylvanian rocks near the base of the Pottsville Formation. It is preserved in pockets in the top of the eroded Conoquenessing sandstone, below the Mercer coal. A generalized section is given.
17. Geologic notes on the Pequea silver mine, Lancaster County, Pennsylvania: Pa. Acad. Sci., Proc. 21, p. 58-63, illus., 1947. Argentiferous galena was once mined from quartz veins in the unconformable contact between the Vintage dolomite (Cambrian) and Conestoga limestone (Ordovician).
18. Relationship of primary and secondary structures on the anticline at Chickies Rock [Lancaster County], Pennsylvania: Pa. Acad. Sci., Proc. 22, p. 122-126, 1948. The Chickies Rock anticline is broken by faults, joints, and cleavage. A cross section gives an excellent opportunity to see the relationships of these to the bedding. The bedding has controlled the orientation of the secondary features.
19. (and Swartz, Frank McKim, and Stephenson, Robert Charles). South Mountain [field] excursion: Field Conf. of Pa. Geologists, 14th, 6 p. (#), Harrisburg] 1948. A mimeographed road log of a trip through the Blue Ridge in Adams, Franklin, and Cumberland Counties with no details is given.

FOOTE, ALBERT E.

1. A new locality for analcite [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 252, 1881. This mineral is reported from the Falls of the Schuylkill, but with no other data.

FOOTE, FREEMAN W.

1. The anthracite of the Hazleton district [Luzerne County], Pennsylvania: S.P. thesis, Colo. Sch. Mines, 1914.

FORD, JOHN

1. Menaccanite from Fairmount Park [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 40, 1883. A curved crystal about four inches long has come from the mica schist at the Girard Avenue bridge in the city. It is bent from the rock-deforming forces.

FORD, WILLIAM EBENEZER

1. George Jarvis Brush [1831-1912]: Science ns. 35, p. 409-411, 1912.

FOSHAY, P. MAXWELL

1. (and Hice, Richard Roberts). Newly discovered glacial phenomena in the Beaver Valley [western Pa.]: Amer. Naturalist 24, p. 816-818. illus., 1890; enlarged, with title, Glacial grooves at the southern margin of the drift: Geol. Soc Amer., Bull. 2. p. 457-464, illus., 1891. Glacial grooves and striae are found several miles south of the terminal moraine. They are in the "fringe" which may mark the earlier epoch of ice. The grooves are deep and cannot be explained so near the edge of the ice. Potholes nearby were formed preglacially when the stream flowed north.
2. Periglacial drainage and recent geological history of western Pennsylvania: Amer. Jour. Sci. 3rd ser. 40, p. 397-403, illus., 1890; discussion with title, Pleistocene fluvial planes of Western Pennsylvania, by F. Leverett, 42, p. 200-212, illus., 1891. Spencer River (preglacial) drained western Pennsylvania to the north. The buried channel is shown in glacial drift thicknesses as recorded in wells and in topographic features, such as abandoned gaps and peculiar present-day courses. The terraces are also used as evidence. Leverett does not agree that an early ice stage reversed the drainage, but rather a late one

FOSTER, MARGARET DOROTHY. See Hall, George Martin, 1; Leggette, Ralph Maxwell, 1; Lohman, Stanley William, 1; Piper, Arthur Maine, 1.

FOX, R. L.

1. (and Grosshart, L. J. H.). Water supply of the Lehigh Valley [Lehigh County]: Engineers Club of Lehigh Valley, Proc. Spring, 6 p., 1924 [not seen].

FRALICH, CHARLES E. See Torrey, Paul Dwight, 3.

FRAIM, PARKE BENJAMIN

1. The geology, mining, and ore dressing of the Cornwall [Lebanon County] ores: M.S. thesis, Lehigh Univ., 1919.

FRANKENFIELD, JOHN S. See Hawkins, Alfred Cary, 3.

FRASER, DONALD McCOY. See also Miller, Benjamin LeRoy, 25, 40; Stose, George Willis, 36; Willard, Bradford, 48.

1. (and others). [Geology] around and near the "Forks of the Delaware" and various and sundry "Gaps": Field Conf. of Pa. Geologists. 2nd. [20 p.] (#), illus. [n.p.], 1932. A mimeographed series of road logs of trips around eastern Pennsylvania describes Precambrian-Ordovician, Triassic, and Pleistocene rocks. Few details are included.
2. Igneous assimilation near Macungie [Lehigh County], Pa.: Pa. Acad. Sci., Proc. 9, p. 34-38, illus., 1935; Lehigh Univ. Inst. Research, Circ. 142 [Sci. Tech. 119], illus., 1938. Evidence is given for the invasion of a dioritic rock by granitic material. Andesine, biotite, and hornblende have been altered and/or replaced.
3. Microscopic investigation of Friedensville [Lehigh County], Pennsylvania, zinc ore: Amer. Mineralogist 20, p. 451-461, illus., 1935. The primary minerals are sphalerite and pyrite. Greenockite is a secondary mineral, suggesting that cadmium is present in the sphalerite. Black-jack sphalerite is common; a small amount is flinty, dense, and massive. Pyrite is common. Silica solutions, later rich in sulphides, invaded the limestone. Calamine is the common secondary mineral; smithsonite is also present, as are a few minor varieties.
4. Paleozoic pegmatites in the Pennsylvania Highlands [Northampton County]: Amer. Mineralogist 21, p. 662-666, illus., 1936. Pegmatite in the Cambrian Hardyston quartzite lends credence to the idea that much of the Paleozoic silicification is due to magmatic solutions. A source of the Friedensville zinc is possibly present.
5. Sericitization in the Pennsylvania Highlands: Pa. Acad. Sci., Proc. 10, p. 66-71, illus., 1936. Rocks rich in sericite are widespread in the Pennsylvania Highlands where they occur in the Byram and Hardyston Formations and the Precambrian schists. The occurrence and distribution of the sericite, the minerals replaced by it, and the nature of the solutions and processes responsible for the alteration are discussed.

6. Shearing action in the Durham and Reading Hills [Lehigh-Northampton Counties], Pa. [abs.]: Geol. Soc. Amer., Proc. 1935, p. 78, 1936.
7. Basic rocks in the eastern Pennsylvania highlands: Amer. Geophysical Union, Trans. [18], p. 249-254 (#), illus. incl. geol. map, 1937. Meta-andesites and meta-diabase as greenstone occur in the Reading Prong. They do not resemble the Precambrian Pochuck gneiss or the Triassic diabase. They are similar to Ordovician volcanics in New Jersey and are so considered in age.
8. Replacement of Hardyston quartzite by jasper [Lehigh County]: Pa. Acad. Sci., Proc. 11, p. 57-61, illus., 1937. Thin sections show that the chert and jasper are in the Hardyston as well as the overlying limestones. Previous mapping techniques using residual jasper as an indicator of limestone areas must be abandoned, and the Reading overthrust becomes more improbable.
9. (and Butler, Robert D.). Prehnite from Coopersburg [Berks County], Pa., with morphologic description by C. S. Hurlbut, Jr.: Amer. Mineralogist 23, p. 583-587, illus., 1938. Prehnite occurs in a vein cutting Triassic diabase. Excellent crystals are present, showing two new forms.
10. (and Getz, Albert J.). Notes on Hardyston quartzite [Berks County]: Pa. Acad. Sci., Proc. 13, p. 94-97, illus., 1939. Heavy mineral studies show no correlation value, but some of the grains show that silicate minerals had been added by hydrothermal activity.
11. Pre-Cambrian geologic history, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 465-466, 1939. The Franklin limestone deposition was followed by the Moravian Heights deposition. The original basic igneous Pochuck gneiss was intruded. Erosion was then followed by acid igneous activity of the Byram gneiss. Pegmatites were intruded, and then extensive erosion occurred before the Cambrian.
12. Stratigraphy and petrography of the pre-Cambrian rocks and Paleozoic igneous rocks, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C 48, p. 159-203, illus., 1939. The Franklin Formation, Moravian Heights Formation, Pochuck gneiss, Byram granite gneiss, and pegmatite of Precambrian age are comprehensively discussed. Albitized rock, pegmatite, and metadiabase of probable Ordovician age are also described.
13. Muscovite and graphite in jasper [Lehigh County]: Pa. Acad. Sci., Proc. 14, p. 43-45, 1940. A piece of jasper contains small flakes of muscovite and graphite. The jasper is composed of small crystals of quartz which have replaced limestone. The mica and graphite are remnants of impurities which were in the limestone before it was replaced by the jasper.
14. Pochuk, Byram, and Losee gneisses in Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 51, p. 1994, 1940.
15. Silicification and local granitization in the Reading Hills [southeastern Pa.] [abs.]: Amer. Geophysical Union, Trans. [21], p. 359-362, illus., 1940. This is an expanded abstract. Quartz and microline-replacing minerals in Precambrian and Cambrian rocks indicate a magmatic source for the solutions that have introduced large volumes of material. The Pochuck and Byram gneisses and the Hardyston quartzite are involved.
16. Stratigraphy and petrography of the pre-Cambrian rocks *in* Lehigh County, Pennsylvania, by B. L. Miller: Pa. Geol. Survey 4th ser., C-39, p. 142-160, illus., 1941. The Franklin Formation, Moravian Heights Formation, Pochuck gneiss, metadiabase, Byram granite gneiss, and pegmatite are described.

FRAZER, PERSIFOR, JR., 1844-1909. See also Bailey, J. Trowbridge, 1; Blandy, John F., 2; Hall, Charles Edward, 6, 7; Hill, Frank A., 2; Lesley, J. Peter, 41; Lewis, Henry Carvill, 32; Platt, Franklin, 16; Prime, Frederick, Jr., 1, 3; Rand, Theodore Dehon, 24.

1. Notes on the character of the lower Silurian slates at their outcrops [York County]: Acad. Nat. Sci. Phila., Proc. [28] 1875, p. 76, 1875. An analysis of a "hydromica" slate near York is given.
2. On exfoliation of rock near Gettysburg [Adams County]: Amer. Phil. Soc., Proc. 14, p. 295-297, 1875. The boulders of the "Devils Den" are described. The joint sets are the main controls, permitting weathering to take place "farther in the rock" along the joint planes.
3. On microscopic sections of trap dykes . . . in [Adams County] Pennsylvania

and Connecticut: Amer. Phil. Soc., Proc. 14, p. 430-431, 1875; Acad. Nat. Sci. Phila., Proc. [27] 1875, p. 72, 1875. Thin sections of diabase are described. They differ only microscopically from diabase in Connecticut.

4. On the structure of the York County valley limestone . . .: Acad. Nat. Sci. Phila., Proc. [27] 1875, p. 128-129, 1875. A fault is shown to be present in the valley which previously was considered to be a series of folds. The nature of the fault is not explained.
5. On the traps of the Mesozoic sandstone in York and Adams Counties. Pennsylvania: Amer. Phil. Soc., Proc. 14, p. 402-414, illus., 1875. Chemical analyses and petrographic studies are made on the diabase. Many are described in detail.
6. On the Trias of York County, Pa.: Acad. Nat. Sci. Phila., Proc. [27] 1875, p. 123, 1875. The finding of some dips which are not to the northwest suggests that the Triassic was not deposited on a uniform-sloping floor.
7. Origin of the Lower Silurian limonites of York and Adams Counties: Amer. Phil. Soc., Proc. 14, p. 364-370, 1875. The limonite ores occurring along the [Antietam]-[Tomstown] contact are considered as weathered products of decomposed, pyritiferous schist.
8. Weathering of rocks [Adams County]: Acad. Nat. Sci. Phila., Proc. [26] 1874, p. 228, 1875. An area of diabase rock shows that weathering has progressed in furrows and channels. No explanation is given.
9. Geological map of Adams County, Scale, 1 in. equals 2 miles: Pa. Geol. Survey 2nd, D5, 1876. [Precambrian]-[Ordovician] and [Triassic] rocks are mapped.
10. Notes on some Paleozoic limestones [Adams-York Counties]: Acad. Nat. Sci. Phila., Proc. [28] 1876, p. 60-63, 1876. Analyses of magnesium-bearing limestones are given.
11. Notes on two traps—a case of alteration of earthy sediments [York County]: Acad. Nat. Sci. Phila., Proc. [28] 1876, p. 60, 1876. A baked sandstone which resembles diabase is described.
12. On the age and origin of certain quartz veins [York County]: Acad. Nat. Sci. Phila., Proc. [28] 1876, p. 36, 1876. A quartz vein in a hornblende dolerite has an altered wall, and has fragments in it. Its emplacement is thought to have been slow and cool.
13. Report of progress in the district of York and Adams Counties: Pa. Geol. Survey 2nd, C, viii, 198 p., illus. incl. geol. maps, 1876. A complete detailed description of the two counties is given. Cross sections of Precambrian-Tertiary rocks are included. Iron is the chief economic product. The ore is magnetite and residual limonite.
14. [The glaciation of South Mountain, Adams County]: Amer. Phil. Soc., Proc. 14, p. 647, 1876. Striated boulders of bedrock are interpreted as glacial. A small glacier may have come from Path Valley, west of Chambersburg.
15. A study of the specular and magnetic iron ores of the New Red sandstone in York County, Pa.: Amer. Inst. Mining Engineers, Trans. 5, p. 132-143, 1877; Engineering and Mining Jour. 23, p. 90-92, 1877. The structure of iron-bearing beds near Dillsburg is discussed. Bore-holes are made. The ore is sedimentary, and the diabase was intruded later along zones of weakness. The repetition of iron-ore beds is not due to faulting, but repeated or irregular deposition.
16. Classification of coals: Amer. Inst. Mining Engineers, Trans. 6, p. 430-451, 1877; Pa. Geol. Survey 2nd, MM, p. 128-143, 1879; discussion by J. P. Lesley, p. 144-157; discussion by A. S. McCreath, p. 157-158. A classification of coal is presented on the basis of fuel ratio, and examples from Pennsylvania are used.
17. On copper-bearing rocks of the Mesozoic formation [Adams County]: Acad. Nat. Sci. Phil., Proc. [29] 1877, p. 17-19, 1877. Copper salts are present in the micaceous and specular iron ore along the north border of the Triassic. A deposit near Bonnaughton is described. Malachite is common. The bed of ore is about one foot thick. Analyses are given.
18. On the Hudson River and Utica slates of Pennsylvania: Acad. Nat. Sci. Phila., Proc. [29] 1877, p. 14-16, 1877. A formal declaration that the black

shales and slates are not coal is made. Examples are given of poor investments accordingly. Analyses are given.

19. Regarding some Mesozoic ores [Adams-York Counties]: Amer. Phil. Soc., Proc. 16, p. 651-655, 664-665, 1877. The copper and iron deposits are in a series of northeast-southwest trending lines, unrelated to the dip of the Triassic rocks. This eliminates the theory that they are sedimentary in origin, resulting from resedimentation of the underlying Precambrian schist.
20. Report of progress in the counties of York, Adams, Cumberland, and Franklin: Pa. Geol. Survey 2nd, C-2, p. 201-400, illus. incl. geol. map, 1877 [continued from C, 1876]. The iron ore deposits at Dillsburg and along the Blue Ridge are described in detail. Cross sections from various parts of the counties are also included. The regional geology is only briefly discussed.
21. The copper ores of Pennsylvania: Polytechnic Review 3, p. 158-159, 168, 170, 1877. Copper occurs in the [Precambrian] rocks of the Blue Ridge (Adams County) and throughout the Triassic rocks. The only commercial production is from the Precambrian. Various copper minerals and native copper are present.
22. The position of the American New Red sandstone. Amer. Inst. Mining Engineers, Trans. 5, p. 494-501, 1877; Engineering and Mining Jour. 23, p. 297-298, 1877; addition with title, The Mesozoic sandstone of the Atlantic slope: Amer. Naturalist 13, p. 284-292, 1879. The characteristics of the Triassic of the U. S. [and Adams County] are described and compared with those of Europe. The section in Adams County is unusually thick and may occupy the whole of the Triassic and some of the Jurassic.
23. [Geological section along the Susquehanna River in Lancaster County]: Amer. Phil. Soc., Proc. 17, p. 719-720, 1878. Very broad and regular anticlines occur in the section of [Conestoga] Formation and [Cambrian] limestones. The total thickness is over 3000 feet.
24. [Recent discovery of the "Martic" anticlinal crossing Lancaster County]: Amer. Phil. Soc., Proc. 17, p. 725, 1878. An anticlinal axis can be detected along the Susquehanna River which, if extended eastward, would become the Welsh Mountains.
25. [Trap dike extending through Lancaster County]: Amer. Phil. Soc., Proc. 17, p. 270, 1878. A dike is mentioned as occurring near Nickel Mines and trending northeastward toward the Welsh Mountains. It is probably post-Cambrian [or Triassic].
26. [Copper veins near Liberty, Md., and Monterey, Adams County—and the structure of Chiques rock near Columbia, Lancaster County]: Amer. Phil. Soc., Proc. 18, p. 220-221, 1879. The copper ore in Adams County is 28 percent metal whereas that in Maryland is 4-5 percent. The geologic-geographic coincidence is noted. Chickies Rock is defined as a southward dipping monocline with the north side faulted. No details are given.
27. On the physical and chemical characteristics of a trap occurring at Williamson's Point [Lancaster County]: Amer. Phil. Soc., Proc. 18, p. 96-103, illus., 1879. An isolated diabase body is studied from thin sections. Magnetite, hematite, rutile, labradorite, and pyroxene are the major constituents. Analyses are given.
28. [Determination of the Peach Bottom slates of Lancaster and York Counties to be Hudson River Age]: Amer. Phil. Soc., Proc. 18, p. 366-369, 1880. If the Peach Bottom slates are [Ordovician], they could lie unconformably on Precambrian rocks. The facies change from these to the highly crystalline hydromica schists of the north limb of the Tuquan anticline is hard to imagine, however. Analysis of the Peach Bottom slate shows a high percent of carbon, but not graphite.
29. The geology of Lancaster County: Pa. Geol. Survey 2nd, CCC, x, 350 p., illus. incl. atlas, 1880. A complete geologic description of the county is given. [Precambrian]-[Tertiary] rocks are mapped. Detailed cross sections along the Susquehanna are included. The mineral deposits are: copper, nickel, magnesite, slate, serpentine, chromite, and iron. Analyses are made. The copper ore of Adams County is discussed in the appendix, and a map of York County is included.

30. Relations of the graphite deposits of Chester County, Pa., to the geology of the rocks containing them: Amer. Inst. Mining Engineers, Trans. 9, p. 730-733, 1881. The metamorphic rocks are described, as are some graphite deposits. The rocks are assigned to the [Precambrian] by virtue of the graphite present.
31. Mémoire sur la géologie de la partie sud-est de la Pennsylvanie: Soc. géol. du Nord, Mem. 1, no. 2, 178 p., illus., Lille, 1882. A complete description of the rocks of the area is given. [Precambrian] to Triassic rocks are described, as are some of the copper and zinc deposits. A lesser amount of description of the structure along the Susquehanna River is also given.
32. The Eozoic and lower Paleozoic in south Wales, and their comparison with their Appalachian analogues: Science 1, p. 108-109, 1883. The Cambrian sequence in Wales resembles that in southeastern Pennsylvania in kinds of rocks, paragenesis, topography, and accessory-mineral content. The post-Cambrian of the Appalachians resembles the post-Cambrian in Wales.
33. An hypothesis of the structure of the copper belt of the South Mountain [Adams County]: Amer. Inst. Mining Engineers, Trans. 12, p. 82-85, illus., 1884. Native copper occurs in epidotic quartzite which is between chlorite schist and orthofelsite. It has been deposited in fault fissures which are not everywhere present but which are often repeated.
34. The northern serpentine belt in Chester County, Pa.: Amer. Inst. Mining Engineers, Trans. 12, p. 349-355, 1884. Serpentine rock and outcrop patterns are described and analyzed. The serpentine results as a product of a metasomatized layer or layers of hydromica schist.
35. The Peach Bottom slates of southeastern York and southern Lancaster Counties: Amer. Inst. Mining Engineers, Trans. 12, p. 355-359, illus., 1884. A very detailed cross section along the Susquehanna River shows much detail about the slate district. The question about their being conformable on the [Peters Creek Formation] or down-faulted is discussed. Fossils (?) are illustrated and described. Hall calls them algae of [Ordovician] age.
36. A study of one point in the Archean-Paleozoic contact line in southeastern [Montgomery County] Pennsylvania [abs.]: Amer. Assoc. Adv. Sci., Proc. 33, p. 394-396, illus., 1885. Evidence is shown for an overthrust, bringing Precambrian schist in contact with [Cambro-Ordovician] limestone in Chester Valley.
37. Sketch on the geology of York Co., Pa.: Amer. Phil. Soc., Proc. 23, p. 391-410, illus. incl. geol. map, 1886. A complete, but generalized description of the county is given. Precambrian to Triassic rocks are present. Each System is described. Some rock analyses are given. Copper and iron ores are described.
38. Henry Carvill Lewis [1853-1888]: Franklin Inst., Jour. 126 (3rd ser. 96), p. 154-155, 1888.
39. Joseph Leidy, [1823-1881] M.D., LL.D.: Amer. Geologist 9, p. 1-5, port., 1892.
40. Thomas Sterry Hunt . . . [1826-1892]: Amer. Geologist 11, p. 1-13, port., 1893.
41. Alphabetical cross reference catalogue of all the publications of Edward Drinker Cope . . . 1859-1897: Soc. Cientifica Antonio Alzate, Mem. 14, p. 39-72, 233-256, 439-466: 15, p. 31-96, Mexico, D. F., 1899-1900.
42. The life and letters of Edward Drinker Cope [1840-1897]: Amer. Geologist 26, p. 67-128, port., 1900.
43. Memoir of Franklin Platt [1844-1900]: Geol. Soc. Amer., Bull. 12, p. 454-455, 1901.
44. Catalogue chronologique des publications de Edward Drinker Cope, de 1859 à 1897, inclusivement: Soc. géol. Belgique, Annales 29, p. BB, 3-77, Liege, 1901-02.
45. J. Peter Lesley [1819-1903]: Amer. Geologist 32, p. 133-136, port., 1903.

FRAZIER, BENJAMIN WEST, 1841-1905.

1. On crystals of axinite from a locality near Bethlehem [Northampton County], Pa. . . .: Amer. Jour. Sci. 3rd ser. 24, p. 439-447, illus., 1882; Zeitschrift fur Krystallographie 9, p. 81-89, Leipzig, 1882. Axinite crystals are described from a tailings heap near an abandoned zinc pit. Axinite crystals occur in a rock of crystalline hornblende intimately mixed with, and traversed by, numerous veins of axinite.

FREAR, WILLIAM

1. The limestones of Pennsylvania, [Part] 2 *of* The agricultural use of lime: Pa. State College, Ann. Rpt. 1899-1900, Part 2, p. 27-39, 1900. A general review of the limestones of the Commonwealth and their origin is given.
2. Pennsylvania limestone and lime supplies: Pa. State College, Agricultural Experiment Sta., Bull. 127, p. 71-106, illus., 1913. Analyses of limestones by counties are given. A very brief summary of general chemical properties is included.
3. (and Erb, E. S.). The lime resources of Pennsylvania: Pa. State College, Ann. Rpt. 1911-12, p. 272-440, illus., 1913. Limestones from all over the Commonwealth are described with emphasis on the lime-making properties. Analyses are included.

FREEDMAN, JACOB L. See Sampson, Edward, 1.

FREEMAN, LAWRENCE

1. Features common to the Appalachian zinc deposits [abs.]: Ohio Acad. Sci., Proc. 8, p. 176, 1928; Ohio Jour. Sci. 28, p. 154, 1928.

FRETZ, AUGUSTUS HENRY

1. Memorial of F[rederick] B[urrell] Peck [1862-1925]: Amer. Mineralogist 11, p. 55-56, 1926.
2. Benjamin LeRoy Miller, 1874-1944: Iowa Acad. Sci., Proc. 51, 1944, p. 115-116, port. [1945].

FRIDLEY, HARRY MARION

1. Identification of erosion surfaces in south-central New York [and northern Pa.]: Jour. Geology 37, p. 113-134, illus., 1929. The Kittatinny, Schooley, and lower surfaces in New York are correlated with those of northern Pennsylvania.
2. (and Nolting, John B., Jr.). Peneplains of the Appalachian Plateau: Jour. Geology 39, p. 749-755, illus., 1931. Two levels are recognized in southwestern Pennsylvania. They are the Kittatinny at the ridge tops and the "Allegheny" to the west on the softer material.
3. (and Sherrill, Richard Ellis). Relation between slope of peneplains and regional dip of the Allegheny Plateau [abs.]: Geol. Soc. Amer., Proc. 1934, p. 446, 1935.

FULLER, MYRON LESLIE. See also Campbell, Marius Robinson, 2.

1. The Catskill rocks in northern Pennsylvania [abs.]: Science ns 15, p. 664-665, 1902.
2. The Gaines oil field of [Tioga County] northern Pennsylvania: U. S. Geol. Survey, Ann. Rpt. 22, Part 3, p. 573-627, illus., 1902. Lenticular sands of the Devonian are the traps. The Devonian-Pennsylvanian rocks are described. The structure consists of gentle folds, and the Gaines pool is on one flank of one of the folds.
3. (and Alden, William Clinton). Description of the Elkland and Tioga quadrangles [Tioga County]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 93, 9 p., illus. incl. geol. maps, 1903. A complete geologic description of the area is given. Upper Devonian-Lower Pennsylvanian, and Pleistocene rocks are present. Sections are measured. Glacial deposits are extensive. Stone, clay, sand and gravel, natural gas, and iron ore are the mineral resources discussed.
4. (and Alden, William Clinton). Description of the Gaines quadrangle [Potter-Tioga Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 92, 9 p., illus. incl. geol. maps, 1903. A complete geologic description of the area is given. Devonian-Pennsylvanian, Pleistocene rocks are mapped. Gentle folds make up the structure. Petroleum, gas, coal, stone, limestone, iron ore, and gravel are the major economic products.
5. Hyner gas pool, Clinton County, Pa.: U. S. Geol. Survey, Bull. 225, p. 392-395, 1904. One of the first fields to be drilled on the anticlinal principle is described. It is in Devonian rocks, and a log is given. The Catskill and Chemung beds contain the producing zones.
6. Bibliographic review and index of papers relating to underground waters published by the United States Geological Survey, 1879-1904: U. S. Geol. Survey, Water-Supply Paper 120, 128 p., 1905. A brief annotated bibliography of papers, indexed by state, includes the Commonwealth.

7. (and others). Contributions to the hydrology of eastern United States, 1904: U. S. Geol. Survey, Water Supply Paper 110, 211 p., 1905. This contains a series of short papers by many authors, some of which are about the Commonwealth. They are cited individually.
8. [Ground water of] Pennsylvania: U. S. Geol. Survey, Water-Supply Paper 114, p. 104-110, illus., 1905. A very brief review of the geology of the Commonwealth is followed by a discussion of the water-bearing properties of the rocks. A list of springs is given.
9. (and Lines, Edwin F., and Veatch, Arthur Clifford). Record of deep well drilling for 1904: U. S. Geol. Survey, Bull. 264, 193 p., 1905; (and Sanford, Samuel) . . . for 1905, Bull. 298, 299 p., 1906. This is a table, by counties, of wells. Little geologic data are included.
10. Appalachian oil field: Geol. Soc. Amer., Bull. 27, p. 617-654, illus., 1917. A generalized discussion which includes Pennsylvania is given. History, stratigraphy, structure, production, and reserves are mentioned. Devonian-Permian rocks are discussed; the origin of petroleum is considered.

FULTON, JOHN
1. Note on the Somerset County coal beds in Pennsylvania: Amer. Phil. Soc., Proc. 14, p. 157-158, 1874. A generalized description of the Lower Pennsylvanian section and some of the coals in it is given.
2. Notes on Cambria County: Pa. Geol. Survey 2nd, HHH atlas, p. 361-396, 1877 [1889?]. A variety of economic notes includes bore-hole logs for coal and gas. Fire clay is also reported. Sections are measured; analyses are made.

GADDES, JACK. See also Robinson, J. French, 6.
1. Deep sand development in Tioga County, Pennsylvania: Amer. Assoc. Petroleum Geologists, Bull. 15, p. 925-936, illus., 1931; discussion by K. C. Heald, p. 936-937. The gas field is on a dome on the Sabinsville anticline. The Oriskany sand is the reservoir. A well log is given as an example. The gas sand is persistent, medium- to coarse-grained, heavily frosted, and with rounded grains; the porosity is 9 percent.

GAIR, J. E.
1. Some effects of deformation in the central Appalachians: Thesis, Johns Hopkins Univ., 1949.

GALE, THOMAS A.
1. Rock oil in Pennsylvania and elsewhere: 80 p., Sloan and Griffeth, Erie, 1860. A handbook-type of compendum includes a popular account of the occurrence of petroleum in the Commonwealth.

GALEY, JOHN TAYLOR
1. (editor) Appalachian Basin Ordovician symposium: Amer. Assoc. Petroleum Geologists, Bull. 32, p. 1395-1657, illus. incl. geol. maps, 1948. This contains papers by several authors which are cited individually. The Ordovician of many areas, including the Commonwealth, is discussed from the viewpoint of petroleum possibilities.

GARDNER, JAMES HENRY
1. The Broadtop coal field of Huntingdon, Bedford, and Fulton Counties: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 10, 81 p., illus. incl. atlas, 1913. Only Pennsylvanian and Permian (?) rocks are mapped. Fossils are listed; sections are measured. The structure is a gentle, undulating basin. The various coal beds are discussed. Analyses are made.
2. A stratigraphic disturbance through the Ohio Valley, running from the Appalachian Plateau in Pennsylvania, to the Ozark Mountains in Missouri: Geol. Soc. Amer., Bull. 26, p. 477-483, illus., 1915. A fold trend with intervening faults, is traced and includes southwestern Pennsylvania. It is marked in the Commonwealth by the Chestnut Hill anticline and basic intrusive rocks. It relates Appalachian structure to the Ozark area.

GARRETT, S. G.
1. Oriskany gas field of [Tioga County] Pennsylvania and New York: Amer. Assoc. Petroleum Geologists, Bull. 15, p. 837-839, 1931. Gas comes from the Sabinsville anticline. Various features of the pool are described, as is the geology. Other anticlines are present and may be potential oil sources. The surface affords little help in determining the subsurface structure.

GARRETT, T. H. See also Genth, Frederick Augustus, 5.

1. Chemical examination of a few minerals associated with serpentine [Chester County]: Amer. Jour. Sci. 2nd ser. 14, p. 45-48, 1852. Massive chromic iron and placer chrome sand, both magnetic and non-magnetic, are described and analyzed from the Wood mine.

GARRISON, FRANK LYNWOOD

1. The genesis of limonite ores in the Appalachians: Engineering and Mining Jour. 78, p. 470-471, 1904. A general discussion of the topic is given, with examples drawn from the Commonwealth. The ores are considered as deposits by vadose water in the weathered zones above the water table. The iron was leached from the limestones and shales of the region.

GAULT, HUGH RICHARD

1. Petrography of a flood deposit, Lehigh River, Bethlehem [Lehigh County], Pennsylvania, May 1942: Pa. Acad. Sci., Proc. 20, p. 84-88, illus., 1946. The deposits of the 1942 flood are analyzed mechanically and mineralogically. The concept of sorting is discussed along with other sedimentation concepts. Most of the deposited material is local.

GEHMAN, GEORGE W.

1. Some minerals of the Serpentine Range near Easton [Northampton County], Pa.: Rocks and Minerals 11, p. 90-91, 1936. Zircon, wernerite, uraninite, thorianite, autunite, uranophane, thorogummite, and pyrite are mentioned from several quarries.

GEIJER, PER.

1. James Furman Kemp [1868-1925]: Geol. Föreningens i Stockholm, Förh. 48, p. 593, 1926.

GENTH, FREDERICK AUGUSTUS, 1820-1893. See also Cardeza, J. M., 2; Hall, Charles Edward, 7; Hermann, R., 5.

1. [geologic report] *in* First report of the Board of Directors and the Superintendent of the Chester County Mining Co., May 1, 1851: 28 p., illus., Philadelphia, 1851 [not seen, see Miller, B. L., Lead and Zinc in Pennsylvania, p. 44, 1924].
2. Magnetkies von Gap Mine in Lancaster County, Pa., Part 3 *of* Chemische mineralogische Notizen: Nordamerikanischer Monatsberichte 2, p. 250, 1851. "Auf einem Gang, der aus einem Gemenge von Kupferkies, Eisenkies, Magnetkies und Strahlstein besteht, enthält der Magnetkies 2.9 percent nickel. Weder Eisenkies noch Kupferkies enthalten Spuren davon. Das Nickel enthält kein Kobalt."
3. Nickelgymnite von Texas, Lancaster County, Pa., *in* Chemische-mineralogische Beytrage: Nordamerikanischer Monatsberichte 3, p. 487-488, 1851. [Genthite] is analyzed and described.
4. Platin in [Lancaster County] Pennsylvanien, Part 1 *of* Chemische-mineralgischen Notizen: Nordamerikanischer Monatsberichte 2, p. 249, 1851. Traces of platinum, gold, and silver are reported from shales. The percentage of all was .0014. Titanium, silver, and platinum are reported from another locality in the county. No specific data are given.
5. On rhodophyllite, a new mineral [Lancaster County]: Acad. Nat. Sci. Phila., Proc. 6, p. 121-124, 1852; discussion with title, On minerals accompanying chromic iron, by T. H. Garrett: Amer. Jour. Sci. 2nd ser. 15, p. 332-334; reply by author, with title, Kämmererite-Emerald Nickel, *in* Contributions to mineralogy, 2nd ser. 16, p. 169-170, 1853. An aluminum, chromium, iron silicate is described and analyzed and considered as new. Kämmererite is also described from the Wood mine. Garrett describes kämmererite, bronzite, emerald nickel, and dolomite from the same locality. The author points out that he had earlier considered emerald nickel to be kämmererite and that Garrett failed to recognize it.
6. Untersuchen des Mineralwassers von Bristol [Bucks County], Pa.: Nordamerikanischer Monatsberichte 4, p. 246-247, 1852. Ground water from a spring in the alluvium is analyzed.
7. Contributions to [Berks-Northampton Counties] mineralogy: Amer. Jour. Sci. 2nd ser. 19, p. 15-23, 1855. Among many other localities, allanite is identified and described from the Commonwealth. Analyses are given.

8. Lanthanite [Lehigh County], [Part] 14 *of* Mineralogical notes: Amer. Jour. Sci. 2nd ser. 23, p. 425-426, 1857. A physical and chemical description is given.
9. Corundum, its alterations and associated minerals: Amer. Phil. Soc., Proc. 13, p. 361-406, 1873; Univ. Pa. Lab. Contrib. no. 1, 40 p., [n.d. 1873?]; Jour. praktische Chemie 9, p. 49-112, 1874; discussion by T. S. Hunt: Boston Soc. Nat. Hist., Proc. 16, p. 332-335, 1874; reply by author: Amer. Phil. Soc., Proc. 14, p. 216-218, 1874; Amer. Jour. Sci. 3rd ser. 8, p. 221-222, 1874; addition with title, Contributions to mineralogy [Part] 1: Amer. Phil. Soc., Proc. 20, p. 381-392, 1882. A general treatise on corundum includes the famous Chester and Delaware County locations. It occurs in igneous rocks of the area. Its many varieties are discussed. Analyses are included.
10. Investigations of iron ores and limestones from . . . iron ore banks on Spruce Creek, Half Moon Run, and Warrior's Mark Run in Centre, Blair, and Huntingdon Counties, Pa.: Amer. Phil. Soc., Proc. 14, p. 84-99, 1874; reprinted *in* A collection of occassional surveys . . ., by J. P. Lesley, Philadelphia, 1874. Analyses of iron ores and limestones are given. The iron is from residual limonite and Clinton "fossil" ore.
11. Preliminary report on the mineralogy of Pennsylvania, with an appendix on the hydrocarbon compounds by S. P. Sadtler: Pa. Geol. Survey 2nd, B, 206 p., 1875. Analyses and locations of a wide variety of minerals are given. They are grouped chemically. Most are from eastern Pennsylvania.
12. Second preliminary report on the mineralogy of Pennsylvania: Pa. Geol. Survey 2nd, B2, p. 207-238, 1876; correction by C. M. Wheatley: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 36, 1882. Analyses and locations of a wide variety of minerals are given. They are grouped chemically. Most are from eastern Pennsylvania.
13. On pyrophyllite from Schuylkill Co., Pa.: Amer. Phil. Soc., Proc. 18, p. 279-280, 1880; correction by E. S. Reinhold: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 55-56, 1882; Mineralogy and Geol. Sec., Proc. no. 2, p. 22-23, 1882. The mineral is found in thin seams of delicate structure, filling cavities and as cracks in the coal-slate. Physically it resembles damourite. It also constitutes some of the fossil-plant impressions.
14. Alteration of talc into anthophyllite [Lancaster-Delaware Counties], [Part] 3 *of* Contributions to mineralogy: Amer. Phil. Soc., Proc. 20, p. 393-395, 1882. Examples of the alteration are described; physical and chemical descriptions are included.
15. Pyrophyllite in anthracite [Luzerne County], [Part] 8 *of* Contributions to mineralogy: Amer. Phil. Soc., Proc. 20, p. 401-402, 1882. A physical and chemical description is given.
16. Rutile and zircon from the itacolumite of Edge Hill, Bucks County, Pa., [Part] 6 *of* Contributions to mineralogy: Amer. Phil. Soc., Proc. 20, p. 399-400, 1882. The minerals appear as heavy material in [Cambrian] sandstone. All are extremely small.
17. Sphalerite and prehnite, from Cornwall, Lebanon Co., Pa., [Part] 7 *of* Contributions to mineralogy: Amer. Phil. Soc., Proc. 20, p. 400-401, 1882. The minerals are described physically and chemically.
18. Note on a damourite from Berks Co., Pa.: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 47-48, 1883. A damourite is described from Rockland Forges, and upon analysis proves to be a variety of muscovite.
19. (and Wuth, Otto). Analyses of Nittany Valley [Centre County] iron ores and limestones: Pa. Geol. Survey 2nd, T4, p. 385-395, 1884. Material from twelve iron ore localities and nine limestone areas is analyzed.
20. Additional analyses of minerals and rocks from Delaware Co.: Pa. Geol. Survey 2nd, C5, p. 111-120, 1885. A wide variety of items from many different places in the county are described and analyzed. Locations are given.
21. Alteration of magnesian limestone from Berks Co., Pa., [Part] 10 *of* Contributions to mineralogy, no. 14: Amer. Phil. Soc., Proc. 23, p. 40-42, 1886. The infiltration of siliceous waters into decomposed magnesian limestone at Wheatfield and Ruth Mines produces deweylite, brucite, and serpentine. The calcium carbonate is also recrystallized.

22. Orthoclase from French Creek, Chester Co., Pa., [Part] 13 *of* Contributions to mineralogy, no. 14: Amer. Phil. Soc., Proc. 23, p. 43-44, 1886. Columnar, striated, radiating, reddish crystals are analyzed. They are associated with glauconite and magnetite.
23. Lansfordit, ein neues Mineral [Schuylkill County]: Zeitschrift fur Krystallographie 14, p. 255-256, Leipzig, 1888. The mineral, a magnesian carbonate, is described chemically and physically from the culm heaps of anthracite.
24. Mineral collection [Pa. Geol. Survey Museum], *in* Catalogue of the geological museum, Part 3: Pa. Geol. Survey 2nd, 000, p. 93-97, 1889. This is a catalogue of the minerals reported in report B and retained by the museum.
25. On two minerals from Delaware Co., Pa.: Acad. Nat. Sci. Phila., Proc. [41] 1889, p. 50-52, illus., 1889. Gahnite is described from the Smedley feldspar quarry, and columbite is described from Mineral Hill. Both are analyzed.
26. Contributions to mineralogy, no. 48 [Chester County]: Amer. Jour. Sci. 3rd ser. 40, p. 114-120, illus., 1890. Pyrite, containing cobalt and arsenic is described from the French Creek, Chester County mines; scapolite from the same area is described and analyzed.
27. (and Penfield, Samuel Lewis). On lansfordite, nesquehonite, a new mineral, and pseudomorphs of nesquehonite after lansfordite [Schuylkill County]: Amer. Jour. Sci. 3rd ser. 39, p. 121-137, illus., 1890; Zeitschrift fur Krystallographie 17, p. 561-577, illus., Leipzig, 1890. Nesquehonite is an alteration product of lansfordite. It is a hydrated magnesium carbonate. It is completely described. Laboratory tests are made to show the relationship of the two minerals.
28. Alteration of orthoclase into albite [Delaware County], [Part] 2 *of* Contributions to mineralogy: Amer. Phil. Soc., Proc. 20, p. 392-393, 1892. Albite after orthoclase is described from druses in a gneiss quarry near Upper Avondale. Physical and chemical descriptions are included.

GESNER, ABRAHAM

1. On the petroleum springs in North America [abs.]: Geol. Soc. London, Quarterly Jour. 18, p. 3-4, 1862.

GETZ, ALBERT J. See also Fraser, Donald McCoy, 10.

1. The origin and occurrence of the brown hematite ores in Lehigh County: M.A. thesis, Lehigh Univ., 1939.

GIBBS, HARLEY S.

1. Oil and gas possibilities in Somerset and Fayette Counties, Pa. [abs.]: Pan-Amer. Geologist 57, p. 313, 1932.

GIBSON, JOHN BANNISTER, 1780-1853.

1. Observations on the trap rocks of the Conewago Hills near Middletown, Dauphin County, and of the stony ridge near Carlisle, Cumberland County, Pennsylvania: Amer. Phil. Soc., Trans. ns 2, p. 156-166, 1825. Basalt with concentric bands is described physically and topographically. The origin may have been as a flow, although evidence is lacking. Basalt in the Great Valley is also described and the theory of igneous origin is discussed. He concludes that it could be igneous but no evidence exists.
2. . . . geology of the lakes and the valley of the Mississippi . . .: Amer. Jour. Sci. 29, p. 201-213, 1836. The rocks of the western part of the Commonwealth are considered to be [post-Triassic] as the [Catskill] red formation is taken to be New Red sandstone. The [drift] is considered diluvial.

GILBERT, GROVE KARL

1. The name "Newark" in American stratigraphy: Jour. Geology 2, p. 55-59, 1894; discussion by B. S. Lyman, p. 59-61. Argument is given for the use of the term Newark for the Triassic red beds in the eastern United States, including the Commonwealth. It is a geographic term applied to a group of recognizable rocks. Lyman says it is unnecessary, that individual formation names are satisfactory.
2. Memoir of George Hammell Cook, 1818-1889: Natl. Acad. Sci., Biog., Mem. 4, p. 135-144, 1902.
3. Edwin E[ugene] Howell [1845-1911]: Science ns 33, p. 720-721, 1911.
4. Memoir of Edwin E[ugene] Howell [1845-1911]: Geol. Soc. Amer., Bull. 23, p. 30-32, port., 1912.

GILL, THEODORE NICHOLAS

1. Edward Drinker Cope [1840-1897], naturalist—a chapter in the history of science: Amer. Naturalist 31, p. 831-863, port., 1897; Science ns 6, p. 225-243, 1897.

GILLSON, J. See Watson, Edward Hahn, 1.

GILMAN, DANIEL COIT

1. The life of James Dwight Dana [1813-1895]: 409 p., illus. incl. port., Harpers, New York, 1889.
2. Benjamin Silliman, chemist 1779-1864, *in* Leading American Men of Science, by D. S. Jordan, ed.: p. 93-117, port., Holt and Co., New York, 1910.

GIRTY, GEORGE HERBERT, 1869-1939.

1. [Comparison of upper Paleozoic rocks in Ohio and northwestern Pennsylvania]: Science ns 19, p. 24-25, 1904; discussion with title, The term "Bradfordian", by F. A. Bather, p. 434-435. Correlations of the Devonian-[Pennsylvanian] rocks are made. About 500 feet of strata below the Olean conglomerate and above the Chemung Formation are recognized. The term Bradfordian is proposed. Bather says that the term is in use elsewhere.
2. On some new and old species of Carboniferous fossils [Luzerne County]: U. S. Natl. Museum, Proc. 34, p. 281-303, illus., 1908. Five genera and species of pelecypods are illustrated and described from the shale in the anthracite region near Wilkes-Barre. These are redescribed from Lea's earlier work which is incomplete.
3. The Pocono fauna of the Broad Top coal field [Huntingdon County], Pennsylvania: U.S. Geol. Survey, Prof. Paper 150, p. 111-127, illus., 1928. Dark shale in the Pocono Formation, about 500 feet below the top, contains a marine fauna which is described and which includes crinoids, brachiopods, pelecypods, gastropods, and nautiloids.
4. Some linguloid shells from the late Devonian and early Carboniferous rocks of [northwest] Pennsylvania and Ohio: U. S. Geol. Survey, Prof. Paper 193-C, p. 47-67, illus., 1939. Two genera and eleven species of inarticulates are described from the Lower Mississippian and Upper Devonian shales.

GLASS, JEWELL JEANETTE. See Stose, George Willis, 38.

GLASSER, M. See Krynine, Paul Dimitri, 1.

GLEASON, FRANK A.

1. Occurrence of coal in the northern anthracite field [Lackawanna-Luzerne Counties]: Penn State Mining Quarterly 2, p. 3-24, 127-137, 1914. The geology of the Northern field is described. The structure is outlined, and the [Pennsylvanian] rocks and coals are described.

GLENN, LEONIDAS CHALMERS

1. Devonic and Carbonic formations of southwestern New York [and northwestern Pennsylvania]: New York State Museum, Bull. 69, p. 967-989, illus. incl. geol. map, 1903; summary [as abs.], Geol. Soc. Amer., Bull. 14, p. 522-531, 1904. The Upper Devonian-Lower Pennsylvanian section is described. The section in northern Pennsylvania is compared to it. There are [intertonguings] which make certain New York beds absent, or higher or lower in the section than expected.
2. Gerard Troost [1776-1850]: Amer. Geologist 35, p. 72-94, port., 1905.

GLENN, WILLIAM

1. Chrome in the southern Appalachian region: Amer. Inst. Mining Engineers, Trans. 25, p. 481-499, 1895. A historical account of the Wood Chrome mine and other smaller ore areas in Lancaster County is given.

GLENNIE, E. A.

1. Crustal warping in the United States: Gerlands Beitr. Geophysik 46, p. 193-197, illus., Leipzig, 1935. Interpretation of gravity data for the whole United States shows a series of isostatic upwarps and downwarps. Western Pennsylvania is downwarped and eastern Pennsylvania is upwarped. The map has a very small scale.

GODON, SYLVAIN

1. Mineralogical note respecting phosphated lime, and phosphated lead, from [Philadelphia-Montgomery Counties] Pennsylvania: Amer. Mineralogical Jour. 1, p. 30, 1814. [Apatite] is reported embedded in feldspathic rock from Germantown. [Pyromorphite] is reported in veins of pyritiferous copper ore at Perkiomen.

GÖPPERT, JOHANN HEINRICH ROBERT, 1800-1884.

1. Ueber die fossilen Pflanzen-Abdrücke von Mauch Chunk [Carbon County], *in* Reise in das innere Nord-Amerika in den Jahren 1832 bis 1834, by Maximillian, P. zu Wied: Bd. 1, p. 636-642, Coblenz, 1839; also a London edition, 1843, without Göppert. Three genera and three species are described but not illustrated. Exact locations are not given.

GOLDRING, WINIFRED

1. An Upper Devonian species of *Aorocrinus* [Warren County]: Carnegie Museum, Annals 27, p. 109-112, illus., 1938. *Aorocrinus multicostatus* is described from [Catskill?] sandstones at Kinzua.
2. Occurrence of *Gennacocrinus kentuckyensis* (Shumard) in [Carbon County] Pennsylvania: Wagner Free Inst. Sci. Bull. 23, p. 1-3, illus., 1948. A crinoid is described and illustrated from the Hamilton Formation at Lehighton.

GOLDSMITH, EDWARD

1. Notes on some minerals and rocks [Chester, Delaware, Lancaster, Montgomery, and Bucks Counties]: Acad. Nat. Sci. Phila., Proc. [56] 1893, p. 174-180, illus., 1893. Physical and chemical descriptions of pimelite, gabbro-phonolite, and amphibolite from Delaware County, asbefferite and phonolite from Chester County, cacoxenite from Lancaster County, phonolite from Montgomery County, and gabbro-phonolite from Bucks County are given.
2. The petrifaction of fossil bones [Montgomery County]: Acad. Nat. Sci. Phila., Proc. [50] 1898, p. 98-100, 1898. Bones from the Port Kennedy cave have been altered to dolomite. Decaying vegetation is perhaps involved, but the source of the magnesium is uncertain.
3. Volcanic rocks of Mesozoic age in [Montgomery County] Pennsylvania: Acad. Nat. Sci. Phila., Proc. [50] 1898, p. 90-97, illus., 1898. The "trap" in Pennsylvania is extrusive. Lava flow terraces are described in the county. Tachylite is evident. Gabbro-phonolite "ringing rocks" are common also, and form a collapsed crater. Amygdules are illustrated. The area is an old volcanic crater.
4. A collapsing crater [Montgomery County]: Acad. Nat. Sci. Phila., Proc. [52] 1900, p. 424, 1901. A cauldron-like area is considered a collapsed crater. Huge blocks have crept inward and downward. Basaltic columns, tachylite, four lava-flow terraces, and amygdules are the evidence for the crater.

GOOCH, F. A. See Cooke, Josiah Parsons, Jr., 4.

GOODRICH, HAROLD BEACH

1. Early discoveries of petroleum in the United States: Economic Geology 27, p. 160-168, 1932. Wells drilled for water before 1859 but which contained oil are listed. The first one recorded in the Commonwealth was in 1845. After 1859, Pennsylvania led in intentional discoveries for a long time.

GORDON, SAMUEL GEORGE. See also Watson, Edward Hahn, 1, 2.

1. An occurrence of lamellar calcite (argentine) in [Delaware County] Pennsylvania: Amer. Mineralogist 1, p. 55-56, illus., 1916. Argentine occurs as gash-vein fillings in a quarry of granite gneiss, biotite gneiss, and pegmatite. It grades into normal calcite. Zeolites are present.
2. Two American occurrences of epidesmine [Berks County]: Amer. Mineralogist 5, p. 167, 1920. This mineral is noted for the first time in America from a diabase quarry near Robeson. It is associated with natrolite.
3. Desilicated granite pegmatites [Delaware, Chester, and Lancaster Counties]: Acad. Nat. Sci. Phila., Proc. 73, 1921, p. 169-192, illus., 1921. Albitite dikes occur associated with the serpentines of the area. Plumasite, a plagioclase-corundum rock occurs similarly. They are described in detail. They result from reactions occurring between the pegmatite solutions and the basic rocks into which they were intruded.
4. Ordovician basalts and quartz diabases in Lebanon County, Pennsylvania: Acad. Nat. Sci. Phila., Proc. 72, 1920, p. 354-357, illus., 1921. The volcanic rocks occur in the Martinsburg Formation. They are described with no attempt at explanation.
5. Texas, Lancaster County, Pennsylvania: Amer. Mineralogist 6, p. 113-117, 1921. Mica schist, intruded by granite gneiss and pegmatite, overlies igneous

rocks of many kinds, including serpentine. The serpentine is host to many kinds of minerals which are described. Chromium mines are important.

6. The chromite deposits of the State Line serpentines [Lancaster-Chester Counties]: Acad. Nat. Sci. Phila., Proc. 73, 1921, p. 449-454, illus., 1922. Individual deposits are described and are attributed to magmatic segregation. They are all associated with metamorphosed basic rocks.
7. The mineralogy of Pennsylvania: Acad. Nat. Sci. Phila., Special Pub. no. 1, 255 p., illus., 1922. A generalized discussion of the origin of minerals is given, including the variety of ways in which they occur, followed by a generalized description of the variety of rocks in Pennsylvania. The bulk of the work lists minerals found in Pennsylvania and the locations from which they are found.
8. Crystallographic notes on wavellite from . . . [Cumberland, Chester, and Lehigh Counties] Pennsylvania . . .: Acad. Nat. Sci. Phila., Proc. 74, p. 113-119, illus., 1923. Crystals are described and tabulated crystallographically.
9. Variscite (=Peganite=Lucinite) and other phosphates, from Moore's Mill, Cumberland County, Pennsylvania, no. 2 *of* Mineralogical Notes 1-10: Acad. Nat. Sci. Phila., Proc. 77, p. 1-13, illus., 1926. Wavellite, beraunite, cacoxenite, variscite, barrandite, strengite, and globosite (?) are described from an abandoned phosphate pit.
10. Calcite from the French Creek iron mines, Chester County, Pennsylvania, *in* Festschrift Victor Goldschmidt: p. 108-116, illus., C. Winters, Heidelberg, 1928. Calcite crystals of many varieties are described and illustrated.
11. Memorial of George Vaux, Jr. [1863-1927]: Amer. Mineralogist 13, p. 97-101, port., 1928.
12. Meteorites in the collection of the Academy of Natural Sciences of Philadelphia: Acad. Nat. Sci. Phila., Proc. 85, 1933, p. 223-231, 1934. Three examples of those from the Commonwealth are listed. They are from Adams, Somerset, and York Counties.
13. (and Watson, Edward Hahn, and Armstrong, Elizabeth). Mineralogic and petrologic localities north of Philadelphia, trip B *of* Geology of the Philadelphia area, by E. Watson: Field Conf. of Pa. Geologists, 5th, p. 16-18 (#), [n.p.] [1935]. This is a mimeographed itinerary of a field trip to several mineral-collecting quarries. No details are given other than brief descriptions of the rocks in the quarries.

GORMAN, JOSEPH P.

1. Martinsburg shale exposed in excavations on Capitol Hill, Harrisburg [Dauphin County]: Pa. Acad. Sci., Proc. 12, p. 103-105, 1938. The Martinsburg in the building excavations contains a variety of lithologic types; shale, sandstone, conglomerate, and other varieties of rocks are reported. Sections are described. The river gravel, as overburden, is discussed.
2. Shafer Run cave [Somerset County]: Pa. Acad. Sci., Proc. 13, p. 150-152, illus., 1939. A cave in the Loyalhanna limestone of Mississippian age is described. Joints are the main factors. A stream is present.

GOTHAN, WALTER ULRICH EDWARD FREDERICK. See Jongmans, William Josephus, 1, 4.

GRABAU, AMADEUS WILLIAM. See also Field, Richard Montgomery, 1.

1. Fossil faunas of Middle Devonian: B.S. thesis, Mass. Inst. Tech., 1896.
2. Geological excursions in the Pittsburgh coal region: Science ns 16, p. 274-276, 1902. A description of a field trip in which [Pennsylvanian] rocks and coal are described. No details are included.
3. Notes on the character and origin of the Pottsville formation of the Appalachian region [abs.]: Science ns 24, p. 691, 1906; New York Acad. Sci., Annals 18, p. 294, 1908.
4. Relative ages of the Oneida and Shawangunk conglomerates [abs.]: Geol. Soc. Amer., Bull. 16, p. 582, 1906.
5. Types of sedimentary overlap: Geol. Soc. Amer., Bull. 17, p. 567-636, illus., 1906. Overlap in general is discussed, with some examples taken from the Commonwealth. The Cambrian, Devonian, Mississippian, and Pennsylvanian are included.

6. A revised classification of the North American lower Paleozoic: Science ns 29, p. 351-356, 1909. A generalized presentation of a new time-rock scale is offered. Many locations in the Commonwealth are discussed, although none are used as type areas.
7. Physical and faunal evolution of North America during Ordovicic, Siluric, and early Devonic time: Jour. Geology 17, p. 209-252, illus., 1909. A discussion of the paleogeography of the times, includes a description of the various sea advances and retreats, some of which are in the Commonwealth. The formations and their faunas are described and correlated.
8. The Medina and Shawangunk problems in Pennsylvania [abs.]: Science ns 30, p. 415, 1909.
9. Continental formations in the North American Paleozoic: Internatl. Geol. Cong., 11th, Stockholm 1910, C. R. 2, fasc. 8, p. 997-1003, 1912. A listing and brief description of terrestrial formations includes some from the Commonwealth. Few details are included.
10. Stratigraphic and paleontologic features of ancient delta deposits [abs.]: Science ns 35, p. 317, 1912; with discussion: Geol. Soc. Amer., Bull. 23, p. 743-746, 1912.
11. Early Paleozoic delta deposits of North America: Geol. Soc. Amer., Bull. 24, p. 399-528, illus., 1913. The origin and appearance of delta deposits are discussed. The Bald Eagle conglomerate is considered an Ordovician delta, whereas the Ordovician Juniata red beds are subaerial, and the Silurian Tuscarora sandstone is marine. The upper part of the Silurian, primarily the Bloomsburg red beds, is thought to be deltaic also. Fossils are listed; sections are described.
12. North American continent in upper Devonic time [abs.]: Science ns 41, p. 509-510, 1915; Geol. Soc. Amer., Bull. 26, p. 88-89, 1915; discussions, p. 89-90.
13. Stratigraphic relations of the oil-producing to the oil-bearing shales in the Paleozoic of North America, involving a new theory of oil distribution [abs.]: New York Acad. Sci., Annals 27, p. 298, 1917; Geol. Soc. Amer., Bull 29, p. 92-93, 1918.
14. Stratigraphic relationships of the Tully limestone and Genesee shale in eastern North America: Geol. Soc. Amer., Bull. 28, p. 945-958, illus., 1917. The Genesee shale in Pennsylvania is considered as a southern facies of the Tully limestone of New York.
15. Palaeozoic formations in the light of the pulsation theory, 4 vols., xxiv, 680 p., xxii, 751 p., xxx, 850 p., xxxiii, 942 p., illus., Peking, 1936-1938; also 1938 edition of vol. 1. The pulsation theory of universal, simultaneous overlap and regression is demonstrated in part from the Commonwealth. Only the Cambrian and Ordovician Systems are considered in vols. 1, 3, and 4. The Taconic, Cambrian, Cambro-Ordovician (Conococheague and Stonehenge) and Ordovician Systems are considered from individual pulses. Examples are primarily from the southeastern counties.

GRAEBER, CHARLES KARSNER. See also Hickok, William Orville, 4th, 6; Honess, Arthur Pharaoh, 1, 2.

1. The geology and mineralogy of the mica peridotite dike at Dixonville [Indiana County], Pennsylvania: M.S. thesis, Penn. State College, 1925.
2. Structure and stratigraphy of the Brookville quadrange [Jefferson-Clarion Counties] (preliminary report): Pa. Topog. Geol. Survey [4th ser.], Bull. 120, 8 p. (#), illus., 1939. A generalized but complete geologic description of the area is given. Mississippian-Pennsylvanian rocks are at the surface. The structure is mostly folds.
3. (and Foose, Richard Martin). Geology and mineral resources of the Brookville quadrangle, [Jefferson, Clarion, and Armstrong Counties]: Pa. Geol. Survey 4th ser., Topog. Geol. Atlas 54, vi, 136 p., illus. incl. geol. map, 1942. A complete detailed geologic report of the area is given. Mississippian-Pennsylvanian rocks are exposed. Coal, clay, gas, sandstone, and iron are the chief mineral resources.

GRAHAM, JACK BENNETT. See also Adamson, John Howard, Jr., 3; Ashley, George Hall, 78.

GRAHAM, [illegible]

1. Ground-water report for Philadelphia [Philadelphia County] area: Pa. Dept. Internal Affairs, Monthly Bull. 13, no. 11, p. 15-17, illus., 1945. This is a popular account of the occurrence of water in the area. The Cretaceous gravels are by far the best source.
2. Water under Penn's Woods: Pa. Dept. Internal Affairs, Monthly Bull. 15, no. 7, p. 3-8, illus.; no. 8, p. 23-30., illus., 1947. A generalized, popular account of the ground water in the Commonwealth is given.

GRAILICH, JOSEPH

1. Untersuchungen uber den ein-und zweiaxen Glimmer: Kaiserl. Akad. Wissenschaften, Sitzungsb. 11, p. 46-87, Vienna, 1854. A biotite from the Easton area is described and analyzed.

GRANT, ALLAN M.

1. An attempt to correlate the Cambro-Ordovician limestones near Birmingham [Huntingdon County], Pennsylvania, by means of heavy minerals: M.S. thesis, Cornell Univ., 1936.

GRANT, ULYSSES SIMPSON, 4th

1. Geological excursion in the Pittsburgh region [Allegheny County]: Geol. Soc. Amer., Bull. 14, p. 3-4, 1903. A very generalized summary of a pre-convention field trip is given. The area is described cursorily, with some emphasis on the glacial geology.

GRASTY, JOHN SHARSHALL. See Watson, Thomas Leonard, 2.

GRATACAP, LOUIS POPE, 1850-1917.

1. Relation of James Hall [1811-1898] to American geology: Amer. Naturalist 32, p. 891-902, port., 1898.

GREEN, JACOB, 1790-1841.

1. Description of a new trilobite [Huntingdon County]: Amer. Jour. Sci. 32, p. 167-169, 1837. *Asaphus platypleurus* is described from [Devonian?] rocks.
2. Description of several new species of trilobites [Huntingdon County]: Amer. Jour. Sci. 32, p. 343-349, illus., 1837; correction, p. [vii]. *Cryphaeus boothi, C. collitelus, Trimerus jacksonii,* and *T. platypleurus* are described from [Devonian] rocks. Locations are not evident.
3. Description of two new species of trilobites [Huntingdon County]: Acad. Nat. Sci. Phila., Jour. 7, p. 217-226, illus., 1837. *Cryphaeus boothi* and *Asaphis trimblii* are reported from near Huntingdon. No strata are given but they are probably Devonian.

GREEN, W., JR.

1. Notes on the anthracite coal regions of North America: North of England Inst. Mining Engineers, Trans. 13, p. 25-40, illus., Newcastle-on-Tyne, 1864. A review of the district includes a brief description of the [Pennsylvanian] strata; cross sections are included.

GREGORY, HERBERT ERNEST

1. Memoir of Angelo Heilprin [1853-1907]: Geol. Soc. Amer., Bull. 19, p. 527-536, port., 1909.
2. Memorial of Joseph Barrell [1869-1919]: Geol. Soc. Amer., Bull. 34, p. 18-28, port., 1923.

GREGORY, JOHN WALTER

1. Henry Darwin Rogers [1808-1866]—bibliography by C. M. Leitch: 38 p., port., Glascow, 1916.

GREGORY, WILLIAM KING

1. Memorial of Bashford Dean [1867-1928]: Geol. Soc. Amer., Bull. 41, p. 16-25, port., 1930; Bashford Dean Mem. Vol., Archaic fishes, by E. W. Gudger, ed., art. 1, p. 1-42, illus., Amer. Museum Nat. Hist., 1930.
2. Further observations on the pectoral girdle and fin of *Sauripterus taylori* Hall, a crossopterygian fish from the Upper Devonion of [Tioga County] Pennsylvania . . .: Amer. Phil. Soc., Proc. 75, p. 673-690, illus., 1935. Very detailed descriptions of the bones are given. The relations between fish and amphibians are discussed.

GRESLEY, W. S.

1. Note on anthracite "coal-apples" from [Luzerne County] Pennsylvania: Amer. Inst. Mining Engineers, Trans. 21, p. 824-832, illus., 1893. Spheroidal

specimens of anthracite are described. They are ¼ inch to 10¼ inches in diameter and occur promiscuously in certain coal beds. The grain of the coal is parallel to the long diameter. They result from spheroidal weathering of cubic-jointed coal.

2. Notes on some Pennsylvanian calamites [Luzerne-Allegheny Counties] [abs.]: Geol. Soc. London, Quarterly Jour. 49, p. Proc. 9, 1893; Geological Mag. 3rd ser. 10, p. 85, London, 1893.
3. Cone-in-cone—how it occurs in the Devonian series in [Erie County] Pennsylvania, U. S. A., with further details of its structure, varieties, etc.: Geol. Soc. London, Quarterly Jour. 50, p. 731-739, illus., 1894. Apex-up cone-in-cone is described and used as an example to postulate on the origin. They are a species of concretion, resulting from unusual concentrations of minerals exerting pressures around nucleii.
4. The "slate binders" of the "Pittsburg" coal bed: Amer. Geologist 14, p. 356-365, illus., 1894. The uniform shale bands in the coal seam are described. The coal and the shale partings are considered aquatic in origin after all other possibilities are discussed and discarded.
5. A granite boulder near Pittsburgh [Allegheny County]: Amer. Geologist 18, p. 331-332, 1896. A boulder is reported from near the confluence of the Allegheny and Monongahela Rivers, indicating that the glacial boundary should be drawn farther south than it is.
6. Observations regarding the occurrence of anthracite, with a new theory of its origin: Amer. Geologist 18, p. 1-21, illus., 1896. Evidence is listed to show that anthracite is a result of metamorphism, and not pre-burial exposure. Hydrothermal action may have been the metamorphosing agent.
7. Clay veins vertically intersecting coal measures: Geol. Soc. Amer., Bull. 9, p. 35-58, illus., 1898. The veins are composed of compact, indurated clayey material and mixed debris of rocks in clay. The average thickness is 10 inches. They are not limited to coal beds. They formed by the filling of cracks with material from above or outside the coal. The cracks are earthquake phenomena.
8. Possible new coal plants in coal—[Part 1]: Amer. Geologist 24, p. 199-204, illus., 1899;—Part 2, 26, p. 49-55, illus., 1900;—Part 3, 27, p. 6-14, illus., 1901. Peculiar-shaped features resembling plants, stems, seeds, etc., are illustrated and described. Many are from the Pennsylvania coal fields, both anthracite and bituminous. Their enclosing strata are accurately described.

GRIER, NORMAN McDOWELL

1. A preliminary list of the fossil plants occurring in the Pittsburgh coal [Allegheny County]: Carnegie Museum, Annals 9, p. 125-128, 1914. A cut near Wilkinsburg exposes the Pittsburgh coal; twenty-seven plants are identified from it.
2. New forms of calamites [Allegheny County]: Amer. Midland Naturalist 5, p. 147-150, illus., 1917. *Calamites cruciatus harrisoni*, *C. multifoliatus*, and *C. fettermanni* are described and illustrated from the sandstone above the Elk Lick coal near Bellevue.

GRIFFITH, WILLIAM

1. An investigation of the buried valley of Wyoming [Wyoming County]: Wyoming Hist. Geol. Soc., Proc. 6, p. 27-36, illus., 1901. The gouged and glacial-drift-filled Wyoming Valley is described. A topographic map is prepared from coal-company borings. The direction and volume of flow are speculated upon.
2. Kinds and occurrences of anthracite coal: Mining Mag. 13, p. 214-221, New York, 1906. A review of the occurrences of anthracite, including the Commonwealth is given. No details are included.
3. (and Conners, Eli T.). Mining conditions under the city of Scranton [Lackawanna County], Pa.: U. S. Bur. Mines, Bull. 25, 89 p., illus. incl. atlas, 1912. The atlas of maps illustrates the distribution of the coal beds under the city.
4. Approximate columnar sections showing the co-relation of anthracite coal beds of Pennsylvania: Colliery Engineer 34, no. 3, supplement, 1913. A sheet of columnar sections showing correlations of the various coal units in the anthracite fields is given.

GRINNELL, GEORGE BIRD

1. Sketch of Professor O[thniel] C[harles] Marsh [1831-]: Popular Science Monthly 13, p. 612-617, port., 1878.
2. Othniel Charles Marsh, paleontologist, 1831-1899, *in* Leading American Men of Science, by D. S. Jordan, ed.: 283-312, port., Holt and Co., New York, 1910.

GRISWOLD, E.

1. [Report of the hydrography, topography, and geology of Mercer County]: Medical Soc. Pa., Trans. 16, p. 463-470, 1884. A complete but cursory description is given. [Mississippian-Pennsylvanian] rocks are exposed. The coal beds are exposed.

GRISWOLD, WILLIAM TUDOR

1. Pittsburgh coal in the Burgettstown [Allegheny, Beaver, and Washington Counties] quadrangle, Pennsylvania: U. S. Geol. Survey, Bull. 260, p. 402-410, illus., 1905. The coal bed underlies the entire quadrangle, and is shown by a structure-contour map. The coal is described in detail. The structure is a series of basins and domes.
2. (and Munn, Malcolm John). Geology of oil and gas fields in Steubenville, Burgettstown, and Claysville quadrangles . . . [Washington, Beaver, Allegheny, and Greene Counties] Pennsylvania: U. S. Geol. Survey, Bull. 318, 196 p., illus., 1907. The general geology of the region is described. Devonian-Permian rocks are described in detail. Well logs are used to produce sand-conversion maps. Production is from the Devonian and Mississippian sands.

GROSS, L. M.

1. The anthracite of the Hazleton district [Luzerne County], Pennsylvania: S.P. thesis, Colo. School Mines, 1914.

GROSSHART, L. J. H. See Fox, R. L., 1.

GROTH, E. A.

1. Phoenixville [Chester County] quartz: Mineral Collector 7, p. 147-152, 1900. This is a discussion of various occurrences of quartz from the old mines.
2. The minerals of Fairmount Park [Philadelphia County]: Mineral Collector 9, p. 165-170, 1903. A popular account of a large number of mineral localities in the metamorphic rocks of the park is given.

GROTH, P.

1. Die Mineraliensammlung der Kaiser-Wilhelms-Universitat, Strassburg: 271 p., Strassburg, 1878 [not seen, see Miller, B. L., Northampton County, p. 27, 1939].

GROVE, BRANDON H. See Romer, Alfred Sherwood, 1.

GROW, GEORGE C.

1. (ed., and others). Geology of the northern portion of the Appalachian basin, field trip, Amer. Assoc. Petroleum Geologists, Oct. 4-9: 121 p., illus., Pittsburgh Geol. Soc., Pittsburgh, 1948. This is a guidebook for the geology along the Pennsylvania turnpike from Pittsburgh to Harrisburg, and from Harrisburg north to Rochester, N. Y. Only Paleozoic rocks and glacial deposits are seen. The economic geology of petroleum, gas, and various industrial minerals is studied. Road logs, strip maps, and local geological maps are included.

GRUVER, ROBERT M. See Bates, Thomas Fulcher, 1.

GURLEY, WILLIAM FRANK EUGENE. See Miller, Samuel Almond, 3.

GUYOT, ARNOLD

1. On the Appalachian Mountain system: Amer. Jour. Sci. 2nd ser. 31, p. 157-187, illus., 1861. A generalized description of the physiography of the range, including that part in the Commonwealth is given. Most of the observations are about elevations.

GYSS, EMILE B.

1. A geological report of field work done in New York, New Jersey, and Pennsylvania: M.A. thesis, Columbia Univ., 1923.

HADLEY, ARTHUR TWINING

1. James Dwight Dana [1813-1895]: Popular Science Monthly 70, p. 306-308, port., 1907.
2. (and others). James Dwight Dana [1813-1895] centenary: Geol. Soc. Amer., Bull. 24, p. 55-69, 1913.

HAEBERLE, WILLIAM F.

1. Kibblehouse quarry, Perkiomenville [Montgomery County], Pennsylvania: Rocks and Minerals 16, p. 136-137, illus., 1941. Directions to, and a list of minerals from, the quarry are given.

HAERTTER, JOHN H.

1. The southern anthracite coal field: Engineering and Mining Jour. 85, p. 653-656, illus., 1908. An extremely brief discussion of the geology is included with an extensive discussion of production techniques.

HAGUE, ARNOLD, 1840-1917.

1. Othniel Charles Marsh [1831-1899]: U. S. Geol. Survey, Ann. Rpt. 21, Part 1, p. 189-204, 1900.

HAINES, R. See Lewis, Henry Carvill, 11.

HALBERSTADT, BAIRD

1. General map of the bituminous coal fields of Pennsylvania 1892 . . .: Scale, 1 inch equals 4 miles, *in* Pa. Geol. Survey 2nd, Summary Final Report, 1893; also [2nd edition], Pottsville, 1901; also [3rd edition], Pottsville, 1907.
2. Obituary, J. P[eter] Lesley [1819-1903]: Mines and Minerals 23, p. 556, port., 1903.
3. The principal limestone deposits of Pennsylvania and their adaptibility to the manufacture of Portland cement: Pa. Dept. Agriculture, Ann. Rpt. 15, p. 545-555, 1910. This is a review of the limestones in the Commonwealth. No new geologic data are included.
4. The coals of the Pocono (no. X) formation in Pennsylvania: Pa. Dept. Agriculture, Ann. Rpt. 19, p. 404-408, 1914. This is a discussion of the Pocono Formation and why there cannot be any fruitful coal prospecting in it. No new information is included.
5. Memorial of Frank A. Hill [1858-1915]: Geol. Soc. Amer., Bull. 28, p. 67-70, port., 1917.

HALDEMAN, SAMUEL STEHMAN, 1812-1880. See also Taylor, Richard Cowling, 10.

1. Supplement to number one of "A monograph of the Limniades, or freshwater univalves of North America" . . .: 3 p., 1840. *Fucoides ? linearis* is described from south of Reading [Berks County] and north of Columbia [Lancaster County] in [Cambrian] rocks. He calls it a plant and says he earlier described it as *Skolithos linearis*. His earlier work is unknown.
2. Description of several new and interesting animals [Bedford County]: Amer. Jour. Agriculture and Science 6, p. 191-194, 1847. *Aeonia ebonina,* a trilobite, is described. It is probably Trenton in age.

HALE, JOHN M.

1. [Summary of the rocks in an old salt boring in Clearfield County] [abs.]: Amer. Phil. Soc., Proc. 9, p. 459-460, 1865.

HALL, CHARLES EDWARD. See also Platt, Franklin, 16.

1. Notes on glacial action visible along the Kittatinny or Blue Mountain, Carbon, Northampton, and Monroe Counties, Pennsylvania: Amer. Phil. Soc., Proc. 14, p. 620-621, 1876. Evidence is discussed to show where the ice has been south of First Mountain. Crushed slate, till, moraines, and striae are noted.
2. On glacial deposits at West Philadelphia [Philadelphia County]: Amer. Phil. Soc., Proc. 14, p. 633-634, 647, illus., 1876. Angular fragments mixed with the quartz pebbles indicate that the ice reached as far south as the city. Striae are also described, as are boulders of the Oriskany and Tuscarora sandstones.
3. Contribution to paleontology from the Museum of the Second Geological Survey of Pennsylvania [Venango and Beaver Counties]: Amer. Phil. Soc., Proc. 16, p. 621-622, 1877; Pa. Geol. Survey 2nd, Q, p. 72, 1878. New *Eurypterus (Dolichopterus) mansfieldi* is described from the Beaver County Darlington shale (Pennsylvanian), and also *E. pennsylvanicus* from above the Garland conglomerate, in Venango County.
4. Catalogue of the geological museum—Part 1, Collections of rock specimens, Nos. 1 to 4264: Pa. Geol. Survey 2nd, O, 217 p., 1878;—Part 2, Collections of rock specimens, Nos. 4265-8974, Paleontological specimens, OO, 272 p.,

1880. Lists of rock and fossil specimens and localities, mostly from reports of the Survey of other authors are given.

5. (and Stevenson, John James). [Fossils collected in Westmoreland County]: Amer. Phil. Soc., Proc. 17, p. 270, 280, 1878. A list of fossils from the Pottsville Formation includes some fossils which had been known only from the Devonian.
6. The relations of the crystalline rocks of eastern Pennsylvania to the Silurian limestones and the Hudson River age of the hydromica schists: Amer. Phil. Soc., Proc. 18, p. 435-443, illus. incl. geol. map, 1880; discussion with title, Notes on the geology of Radnor and vicinity, by T. D. Rand: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 42-47, 1882; Mining and Geol. Sec., Proc. no. 2, p. 9-16, 1882; discussion by P. Frazer, Jr.: Amer. Naturalist 17, p. 523-526, 1883; reply by author with title, Geology of the Chester Valley of Pennsylvania, p. 646-648, illus.; discussion with title, Geology of Lower Merion and vicinity, by T. D. Rand, p. 965-967; reply with title, Mr. Rand on the geological survey of Chester and Delaware Counties, Penna., by P. Frazer, Jr., p. 1052-1053. The Peach Bottom schists are [Ordovician]. Detailed mapping reveals the following section, from bottom to top: [Precambrian] syenite and granite, Potsdam [Cambrian] sandstone, [Vintage], [Kinzers], [Ledger] Formations, slate and [Ordovician Conestoga] limestone, [Wissahickon] schist [Serpentine] [Peters Creek] schist, and limestone. The structural complexities could be solved if an unconformity were present [which there is]. Rand disagrees in many details.
7. (and Genth, Frederick Augustus). The geology of Philadelphia County and the southern parts of Montgomery and Bucks: Pa. Geol. Survey 2nd, C6, xx, 145 p., illus. incl. geol. map, 1881; discussion with title, Notes on the geology of Lower Merion and vicinity, by T. D. Rand: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 61-67, illus., 1883; Mining and Geology Sec., Proc. no. 2, p. 28-34, illus., 1882; discussion with title, The geological position of the Philadelphia gneisses, by C. H. Hitchcock: Amer. Inst. Mining Engineers, Trans. 12, p. 68-71, 1884; discussion by T. D. Rand and P. Frazer, Jr., p. 72-73; discussion with title, The horizon of the South Valley Hills in Pennsylvania, by P. Frazer, Jr., Amer. Phil. Soc., Proc. 20, p. 510-518, 1882. A complete geologic description of the area is given. [Precambrian]-Ordovician, Triassic, and Tertiary rocks are present. Special emphasis is on the [Precambrian] rocks. Sections are measured; analyses are made. No economic products are considered. Hitchcock discusses the ages of the serpentines; Frazer considers the schists to be [Precambrian].
8. The South Mountain gneiss, etc., *in* Geology of Lehigh and Northampton Counties, by J. P. Lesley: Pa. Geol. Survey 2nd, D3, Part 1, p. 215-259, 1883. This is a reproduction of field notes on the metamorphic region. A very minor amount of interpretation is included.
9. Field notes in Delaware County: Pa. Geol. Survey 2nd, C5, xvi, p. 1-110, 121-127, illus. incl. geol. map, 1885. A complete geologic description of the area, with the emphasis on the petrography and mineralogy, is given. The bulk of the area is underlain by [Precambrian] metamorphic rocks, with some [Cambro-Ordovician] schists; the whole is intruded by Triassic diabase. Tertiary gravel is present in the south. The various metamorphic rocks are quarried for stone.

HALL, GEORGE MARTIN, 1891-1941.

1. Ground-water in southeastern Pennsylvania, with analyses by M. D. Foster and C. S. Howard: Pa. Geol. Survey 4th ser., W-2, viii, 225 p., illus. incl. geol. map, 1934. A description of the different rocks of the region and the water-bearing properties is given. Individual townships are discussed, and well data are included.

HALL, JAMES, 1811-1898. See also Logan, William Edmund, 2; White, Israel Charles, 12.

1. Geology of New York. Part 4, comprising the survey of the fourth geological district: 683 p., illus., Albany, 1843. *Sauripterus taylori* is described from the [Catskill] red beds near Blossburg, Tioga County.
2. Geological map of the middle and western states: Scale, 1:8,500,000, New York [1844?]; discussion with title, [The geographic distribution of fossils in the

Paleozoic strata of the United States] [abs.]: Amer. Jour. Sci. 47, p. 117-118, 1844.

3. Geological history of the North American continent: 24 p., Albany, 1869 [not seen].
4. Record of borings of Gardner oil well no. 3 at East Shamburg [Venango County], Pennsylvania: New York State Museum, Ann. Rpt. 26, p. p. 31-33. 1874. A well, 900 feet deep, is logged. It begins in [Mississippian] rocks and ends in [Devonian] rocks. No interpretation is included.
5. On the geology of the southern counties of New York and adjacent parts of Pennsylvania, especially with reference to the age and structure of the Catskill Mountain Range [abs.]: Amer. Assoc. Adv. Sci., Proc. 24, Part 2, p. 80-84, 1876; Amer. Jour. Sci. 3rd ser. 12, p. 300-304, 1876. A cursory description of the [Devonian] and [Mississippian] rocks is given.
6. Note on the Eurypteridae of the Devonian and Carboniferous formations of [Beaver, Venango, and Warren Counties], Pennsylvania: Pa. Geol. Survey 2nd, P 3, p. 23-39, illus., 1884. Four species of the genus *Eurypterus* are described; two are new. Two are from the Chemung group and two are from the shale below the Darlington coal. They are illustrated.
7. Note on the Eurypteridae of the Devonian and Carboniferous formations of Pennsylvania . . . : Amer. Assoc. Adv. Sci., Proc. 33, p. 420-422, 1885. A review of the Eurypteridae in the United States includes some from Warren, Venango, and Beaver Counties. All are reclassified to genus *Eurypterus*.
8. Note on the intimate relations of the Chemung group and Waverly sandstone in northwestern Pennsylvania [Warren County] and southwestern New York [abs.]: Amer. Assoc. Adv. Sci., Proc. 33, p. 416-419, 1885. Waverly (Mississippian) beds are seen to overlie the Chemung beds with no physical break to represent the Catskill Formation which is between them farther east. They can only be separated paleontologically.
9. New forms of Dictyospongidae from the rocks of the Chemung group: New York State Geologist, Ann. Rpt. 9, p. 56-60, 1890; New York State Museum, Ann. Rpt. 43, p. 258-262, 1890; abstract with discussion by W. Dawson: Geol. Soc. Amer., Bull. 1, p. 22-23, 1890. Three sponges are included from Warren and Tioga Counties. They are Upper Devonian in age.
10. The Oneonta sandstone and its relations to the Portage, Chemung, and Catskill groups (discussion) [abs.]: Geol. Soc. Amer., Bull. 4, p. 8-9, 1892; Amer. Geologist 10, p. 194, 1892.

HALL, R. DAWSON. See also Ashley, George Hall, 15.

1. Geology of Indiana County: Coal Trade Bulletin 25, no. 9, p. 35-38, 1911. A review of the structure of the county is given. The relation of the coal to the gentle anticlines and synclines, and the effects of topography, are discussed.

HALLOCK, WILLIAM

1. Subterranean temperatures at Wheeling, W. Va., and Pittsburgh [Allegheny County], Pa.: Columbia Univ., School of Mines Quarterly 18, p. 148-153, illus., 1897. The temperatures in a Pennsylvania well (5386 feet deep) are recorded, and the increase with depth is noted. It is 127° F. at the bottom and 78° F. at 2350 feet. The depth and temperature combinations compare favorably with those from a well in West Virginia.

HAMILTON, HOWARD V.

1. Some interesting mineral localities near Vandergrift [Armstrong-Westmoreland Counties], Pennsylvania: Rocks and Minerals 21, p. 660-663, illus., 1946. Calcite geodes, hematite, sphalerite, and goethite are described from Westmoreland County. Calcite, aragonite, siderite, marcasite, pyrite, goethite, barite, galena, and quartz are described from localities in Armstrong County.

HAMILTON, S. HARBERT. See also Troost, Gerard, 1; Watson, Edward Hahn, 2.

1. Monazite in Delaware County, Pa.: Acad. Nat. Sci. Phila., Proc. [51] 1899, p. 377-378, illus., 1900. The mineral is described physically. The nature of its occurrence is not mentioned.
2. Sketch of the history of mineralogy in Philadelphia. Mineral Collector 12, p. 17-20, 1905. A historical account of the science is given. Gerard Troost in 1812 founded the Academy of Natural Science, and much has been accom-

plished since this time. The center of knowledge was here until it moved to the Yale University area in 1818.

3. Oriskany explorations in Pennsylvania and New York: Amer. Assoc. Petroleum Geologists, Bull. 21, p. 1582-1590, illus., 1937. The percentage of stable methane in sands is used as a guide to the "methane-ratio" of predicting gas. The porosity of the Oriskany sandstone is described and predicted from the depositional history. Subsurface faults also are present. The Allen field was dry because the porosity was not satisfactory, as the more porous sand occurs on the corrugated Taconic "low" areas. The hydrocarbons in the Oriskany sandstone may be from the Helderberg and Onondaga Formations.

HANNA, JANE. See Averitt, Paul, 2; Pierce, William Gamewell, 1; Richardson, George Burr, 6, 10.

HAPP, STAFFORD COLEMAN

1. Geomorphic history of the Minisink Valley region [Pike-Monroe Counties]: Jour. Geomorphology 1, p. 199-222, illus., 1938; German resumé, p. 223. The Delaware River valley is described physiographically. The various peneplains and erosion surfaces are described, and the drainage evolution is shown.
2. Significance of Pleistocene deltas in the Minisink Valley [Monroe-Pike Counties]: Amer. Jour. Sci. 5th ser. 36, p. 417-439, illus., 1938. The Delaware River valley has been widened by continental glacial action, and glacio-fluvial deposits have filled much of it. Ice dams from stagnant ice created lakes into which came deltaic deposits. Kames and eskers are also present. The deltas form terraces which are essentially unaltered.

HARDEN, E. R. See Lesley, J. Peter, 55.

HARDEN, J. W.

1. The brown hematite ore deposits of South Mountain, between Carlisle, Waynesborough, and the southeastern edge of Cumberland Valley [Cumberland-Franklin Counties]: Amer. Inst. Mining Engineers, Trans. 1, p. 136-144, 1873. The occurrences of the ore as residual deposits in the clay along the Blue Ridge flank are described.

HARDER, EDMUND CECIL

1. Deposits of brown iron ore near Dillsburg, York County, Pennsylvania: U. S. Geol. Survey, Bull. 430, p. 250-255, 1910. Limonite was concentrated by meteoric water from disseminations in the limestone which is now weathered. It may have come from shale and sandstone also. Several deposits are described.
2. Manganese deposits of the United States . . .: U. S. Geol. Survey, Bull. 427, 298 p., illus., 1910. A complete discussion of manganese occurrences includes the Commonwealth, which is considered a minor source. It occurs in small quantities with the iron ores.
3. Structure and origin of the magnetite deposits near Dillsburg, York County, Pennsylvania: Economic Geology 5, p. 599-622, illus., 1910. Diabase of Triassic age has intruded Cambo-Ordovician limestones and Triassic shale; metamorphism has occurred. The ore is in layers in the limestone below the diabase. The ore solutions came with the diabase, along the same conduits, and were forced out of the cooling mass into the metamorphosed sedimentary rocks.
4. (and Hewett, Donald F.). Recent studies of domestic manganese deposits: Amer. Inst. Mining and Metallurgical Engineers, Trans. 63, p. 3-50, illus., 1920. Manganese ore of the U. S. is considered stratigraphically. In the Commonwealth it occurs in Cambrian rocks as a secondary deposit from leaching.

HARDING, RICHARD WALTER

1. Preliminary correlation of the Bradford and Richburg oil sands [New York-Tioga County]: Producers Monthly 13, no. 8, p. 24-25, illus., 1949. Stratigraphic and petrographic evidence is presented to show the depositional equivalence of the Bradford third sand to the Richburg second sand in New York. A cross section is included.

HARDMAN, E. T.

1. On the origin of anthracite . . . [abs.]: Royal Geol. Soc. Ireland, Jour. 14, p 200-209, Dublin, 1876. In a general discussion, the anthracite of the Commonwealth is considered to be of igneous origin. The heating of bituminous coal by igneous rock associated with the Triassic diabase is considered a possibility. Its association with the flexures is coincidental.

HARDT, ANTON

1. The Blossburg [Tioga County] coal region: Mines and Minerals 19, p. 126-128, illus., 1898. This is a review of the [Pennsylvanian] stratigraphy, coal resources, and mining methods of the area.

HARLAN, RICHARD, 1796-1843.

1. Description of an extinct species of fossil vegetable of the family Fucoides [Mifflin County]: Acad. Nat. Sci. Phila., Jour. 6, p. 289-295, illus., 1831. *Fucoides allegheniensis* is described from [Silurian?] rocks, 10 miles east of Lewistown.
2. Description of a new fossil plant [Schuylkill County] Pennsylvania of the genus *Equisetum:* Geol. Soc. Pa., Trans. 1, p. 260-262, illus., 1835. *Equisetum stellifolium* is described and illustrated from the anthracite fields. This is the first fossil occurrence of this form in America.
3. Notice of fossil vegetable remains from the bituminous coal measures of [Cambria County] Pennsylvania . . .: Geol. Soc. Pa., Trans. 1, p. 256-259, illus., 1835. *Pecopteris obsoleta, P. milleri,* and *Neuropteris* are described and illustrated from somewhere near Johnstown. The description is in Latin. Mention is made of *Lycopodiolites dichotomus* from the [Devonian] of Perry County.

HARRINGTON, BERNARD JAMES, 1848-1907.

1. Sir William Edmond Logan [1798-1875]: Canadian Naturalist ns 8, p. 31-46, port., 1876; Amer. Jour. Sci. 3rd ser. 11, p. 81-93, 1876.

HARRIS, GILBERT DENNISON. See Dall, William Healy, 1.

HARRISON, ALFRED C.

1. (and others). Persifor Frazer [Jr.], 1844-1909: Franklin Inst., Jour. 168, p. 75-79, port., 1909.

HARTMAN, W. D.

1. Medical topography and geology [Chester County]: Medical Soc. Pa., Trans. ns 2, p. 109-118, illus. incl. geol. map, 1857. A complete geologic description of the area is given. [Precambrian-Triassic] rocks are mapped but neither named nor assigned ages. Mineral deposits are indicated.

HARVEY, ISAAC A.

1. Report on certain coal lands of R. R. Bridgens & Co. situated in the Karthaus coal basin, Clinton Co., Pa.: 13 p., illus., Democrat Printing House, Lock Haven, 1889. This is a prospectus on the area in East Keating township. Beds from Mercer coal to Lower Freeport coal are described in detail. Twenty-one million tons are in reserve. Fire clay and iron ore are possible resources. A section is measured.

HAWES, GEORGE WESSON, 1848-1882.

1. (and others). Report on the building stones of the United States . . .: U. S. 10th census 10, 410 p., 1884. A complete review of the stone industry of the United States includes the Commonwealth. The resources of Archean rocks, serpentine, limestone, sandstone, conglomerate, and slate are described in detail. Few new details are included, however.

HAWKINS, ALFRED CARY

1. Lockatong formation of the Triassic of New Jersey and Pennsylvania: New York Acad. Sci., Annals 23, p. 145-176, illus. incl. geol. map, 1914. A complete description of the black shale formation is given. Sections are measured; fossils are listed. It is recognized as a lake facies of other Triassic rocks adjacent to it.
2. Alternative interpretations of some crystalline schists in southeastern Pennsylvania: Amer. Jour. Sci. 5th ser. 7, p. 355-364, illus., 1924. The "Wissahickon" schist in the Avondale area is Ordovician. Much of the Baltimore gneiss may be intruded Wissahickon schist. The sedimentary rocks around Avondale are the same sequence as those around the Chester Valley except that the former have been intruded and thereby more altered to resemble the true Wissahickon schist of the type area.
3. (and Frankenfield, John S.). Pyrite from Cornwall [Lebanon County], Pennsylvania: Amer. Mineralogist 11, p. 252-253, illus., 1926. A pyrite crystal with an unusual number of faces (44), some of them new, is described.

4. Twisted millerite crystals [Luzerne County]: Amer. Mineralogist 18, p. 274-275, 1933. Cavities in quartz veins contain minute aggregates of millerite. Some are helically twisted. It is explained as the natural growth tendency of this mineral.

HAY, OLIVER PERRY

1. The Pleistocene of North America and its vertebrated animals from the states east of the Mississippi River and from the Canadian provinces east of longitude 95°: Carnegie Inst. Washington, Pub. 322, 499 p., illus., 1923. The vertebrate faunas of the Port Kennedy cave in Montgomery County and the Frankstown cave in Blair County are included. Mastodons are reported from many places, as are mammoths, horses, tapirs, peccaries, camels, deer, elks, caribous, musk oxen, bison, and beavers. A review of Pleistocene geology and the vertebrate fauna is included.

HAYDEN HORACE EDWIN

1. Ralph Dupuy Lacoe [1824-1901]: Wyoming Hist. Geol. Soc., Proc. 6, p. 39-51, port., 1901; Amer. Geologist 28, p. 335-344, port., 1901.

HAYDEN, HORACE HANDEL

1. . . . geology of the country near Bedford Springs in [Bedford County] Pennsylvania . . .: Amer. Jour. Sci. 19, p. 97-104, 1830. A generalized description of the area is given. Medicinal springs are mentioned, as are various types of rocks and the presence of fossils. No details are given. and no geologic interpretation is attempted.

HAYES, CHARLES WILLARD. See also Willis, Bailey, 2.

1. The coal fields of the United States: U. S. Geol. Survey, Ann. Rpt. 22, Part 3, p. 7-24, illus., 1902; U. S. Geol. Survey, Bull. 213, p. 257-269, 1903. A summary of all the fields in the country, includes those of the Commonwealth. Very brief generalized descriptions of ages and occurrences are given.

HEADLEE, ALVAH JOHN WASHINGTON. See Price, Paul Holland, 5, 6.

HEALD, KENNETH C. See Gaddess, Jack, 1; Richardson, George Burr, 6.

HECK, EDWARD TIMMEL

1. Barium in Appalachian salt brines: Amer. Assoc. Petroleum Geologists, Bull. 24, p. 486-493, illus., 1940. Barium chloride occurs in analyses of brines from rocks of Silurian-Pennsylvanian age in western Pennsylvania. It probably comes from barite which was deposited as a sediment and which has gone into solution. There is more in areas of greater production.
2. Future possibilities for oil and gas in New York state, with comments on entire Appalachian Basin: Drilling and Production Practice 1946, p. 325-333, illus., Amer. Petroleum Inst., 1947; discussions, p. 333-334. This is a general discussion about future geologic possibilities for petroleum, especially in the Oriskany sandstone and deeper formations.

HECKMAN, OLIVER S. See Ulmer, L. J., 1.

HEEREN, LILLIAN. See Dickey, Parke Atherton, 6.

HEILPRIN, ANGELO, 1853-1907. See also Ashburner, Charles Albert, 35.

1. [New trilobite from Walpack Ridge, Monroe County]: Science 4, p. 154, 1884. A tail fragment of a genus related to *Phacops* is reported from the Stormville shale (Devonian). The associated fauna is listed.
2. Note on a collection of fossils from the Hamilton (Devonian) group of Pike Co., Pa.: Acad. Nat. Sci. Phila., Proc. [35] 1883, p. 213, 1883. A fauna including a coral, mollusks, brachipods, bryozoans, and trilobites is listed from near Dingman's Ferry.
3. The Port Kennedy [Montgomery County] deposit: Acad. Nat. Sci. Phila., Proc. [47] 1895, p. 451, 1896. The bones and sediments in the cave appear to be Pliocene rather than post-Pliocene. They have been deposited in glacial debris by glacial floodwaters which were in the area.

HENDERSON, C. HANFORD

1. The copper deposits of the South Mountain [Adams-Franklin Counties]: Amer. Inst. Mining Engineers, Trans. 12, p. 85-90, illus., 1884. Native copper occurs in bands in the Precambrian rock at the contact of orthofelsite and chlorite schist or in the chlorite near the orthofelsite. Several deposits are described.

HENDERSON, EDWARD PORTER. See Preston, Frank W., 1.

HENNEN, RAY VERNON

1. Israel Charles White [1848-1927]: Amer. Assoc. Petroleum Geologists, Bull. 12, p. 339-351, port., 1928.

HEPBURN, S. See Disbrow, Levi, 1.

HERMANN, R.

1. Untersuchungen einiger nordamerikanschen Mineralien: Jour. praktische Chemie 47, p. 1-15, Leipzig, 1849. Pennite, [lansfordite] a hydrated magnesium carbonate, is described from the Wood Chrome mine near Texas, Lancaster Co. It is analyzed physically and chemically.
2. Ueber die Identität von Williamsit und Serpentin [Chester County]: Jour. praktische Chemie 53. p. 31, Leipzig, 1851. A williamsite crystal is analyzed and shown to be a variety of serpentine.
3. Untersuchungen über die Glimmer und Cordierite, besonders über-Mazonit, chloritoid, Perl-glimmer Kämmererit, Rhodochrom, Baltimorit, und Chrom-chlorit [Chester County]: Jour. praktische Chemie 53, p. 1-30, Leipzig, 1851. Emerylite, corundellite, and euphyllite are described in relation to margarite from Chester County. A chromium-bearing chlorite [kämmererite] is described from Lancaster County. Physical and chemical comparisons are made.
4. Ueber monklinoëdrisches Magnesiahydrate oder Texalith [Lancaster County]: Jour. praktische Chemie 82, p. 368-369, illus., Leipzig, 1861. Texalith from the Wood mine is reexamined and is considered the same as brucite. Chemical and physical descriptions are included.
5. Untersuchungen verschiedener Mineralien: Soc. Imperiale des Naturalistes, Bull. 2nd ser. 41, p. 491-502, Moscow, 1869; Jour. praktische Chemie 106, p. 65-73, Leipzig, 1869; correction with title, The so-called gibbsite from Chester County, Pa., a phosphate, *in* Contributions to mineralogy, no. 49, by F. A. Genth and S. L. Penfield: Amer. Jour. Sci. 3rd ser. 40, p. 206-207, 1890. Hydroargillite [gibbsite] and wavellite are described and analyzed. The wavellite is gibbsite. Genth says it is not gibbsite but is a "hydrous aluminum phosphate of some unknown substance."

HERR, LAURISTON B.

1. The limestones of Lancaster County: E. M. thesis, Lehigh Univ., 1917.

HERSEY, JOHN BRACKETT

1. Gravity and magnetic studies along the Paleozoic-Triassic contact in [Bucks-Northampton Counties] eastern Pennsylvania: Amer. Geophysical Union, Trans. [22], Part 2, p. 350-353, illus., 1941. Gravity anomalies show a distinct relationship to Triassic diabase. Magnetic "highs" occur on the trap side of the contacts and "lows" on the sediment side. No details are given.
2. Gravity investigation of central-eastern Pennsylvania: Ph.D. thesis, Lehigh Univ., 1942: Geol. Soc. Amer., Bull. 55, p. 417-444, illus. incl. geol. map, 1944. Gravity maps are made in the area of Berks, Bucks, Lehigh, and Northampton Counties. Regional and local anomalies are described. The local anomalies correlate with structural trends. Comparison is made to a geologic map.

HERSHELMAN, WILLIAM L.

1. A study of the physical properties of the Venango oil sands: M.S. thesis, Syracuse Univ., 1938.

HESS, HARRY HAMMOND

1. Appalachian peridotite belt [abs.]: Geol. Soc. Amer., Bull. 51, p. 1996, 1940.

HESSE, CONRAD E.

1. The paint-ore mines at Lehigh Gap [Carbon County]: Amer. Inst. Mining Engineers, Trans. 19, p. 321-330, illus., 1891. A description of a zone of ochre-bearing limestone in the Devonian is given.

HESSENBERG, FREDERICH

1. Brucit (Talkhydrat) [Lancaster County], *in* Mineralogischen Notizen: Senckenbergische naturforshung Gesell., Abh. 4, p. 1-45, illus., Frankfort, 1862-63. Crystals of brucite are described in detail, analyzed, and illustrated. They are from the Wood mine.
2. Brucit [Lancaster County], in Mineralogischen Notizen, no. 8: Senckenbergische naturforshung Gesell., Abh. 7, p. 45-46, Frankfort, 1869. A sample of brucite is described.

HEUNE, F. von. See Bock, Wilhelm, 1.

HEURTAEAU, C. E.

1. Les charbons gras de la Pennsylvanie et de la Virginie occidentale: Annales des Mines, Mem. 10th ser. 3. p. 379-475., illus., Paris, 1903. A review of the [Pennsylvanian] and [Permian] rocks of the western counties is given, along with a description of the coal beds.

HEWETT, DONALD F. See Harder, Edward Cecil, 4.

HEWITT, ABRAM S.

1. Map showing iron ore and coal regions of the [northeastern] United States: No scale [about 1:6,000,000] [n.p.] [n.d.].

HICE, RICHARD ROBERTS. See also Chance, Henry Martyn, 19; Foshay, P. Maxwell, 1; Lovejoy, Ellis, 1.

1. The inner gorge terraces of the Upper Ohio and Beaver rivers [western Pa.]: Amer. Jour. Sci. 3rd ser. 49, p. 112-120, 1895. The alluvium on the Upper Terrace of the Beaver River, below the glacial boundary, is clayey, with occasional gravel. The alluvium on the Lower Terrace is gravel. Water gaps in tributaries are post-Terrace in age. Buried channels are traced. The inner terrace in places has a bedrock floor which accounts for different appearances. The cutting of the inner gorge was in two periods: (1) time from outer terrace down to rock floor where base level was attained, and (2) cutting the inner gorge which was then partly filled by glacial gravel.
2. Northward flow of ancient Beaver River [western Pa.]: Geol. Soc. Amer., Bull. 14, p. 297-304, illus., 1903. The preglacial Beaver River flowed north. Pre-Wisconsin ice created Lake Monongahela and caused the overflow to go south. Wisconsin ice filled the channel with debris into which the present Beaver River is now cutting. Potholes in the channel show that the flow was once to the north.
3. The clays of the upper Ohio and Beaver River region: Amer. Ceramic Soc., Trans. 7, p. 251-261, illus., 1905; discussions, p. 261-262. Carboniferous and Quatenary clays are described. The glacial-lake clays are useful; later alluvial clays are not.
4. The preglacial drainage of western Pennsylvania [abs.]: Science ns 29, p. 40, 1909.
5. Unusual distortion of the Lower Kittanning coal [Beaver County] [abs.]: Geol. Soc. Amer., Bull. 22, p. 716-717, 1911.
6. The geological origin of the freshwater fauna of Pennsylvania—introductory note: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1910-12, p. 130-134, illus., 1912. A brief resumé of the drainage changes in the Commonwealth during the Pleistocene is given. The damming of the north-flowing streams to form Lake Monongahela is described. This was followed by the divide being overtopped which initiated the drainage to the south.
7. (editor). Geologic map of southwestern Pennsylvania: Scale, 1 inch equals 4 miles, Pa. Topog. Geol. Survey [3rd ser.], Rpt. 2, 29 p., illus. incl. geol. map, 1914. Ordovician-Permian rocks are mapped. The text describes the Devonian-Permian rocks and the structure, which is primarily folds. Many cross sections are included.
8. Oil and gas map of southwestern Pennsylvania: Scale 1:250,000, text, x, 22 p., Harrisburg, 1916.
9. The white clay possibilities of Pennsylvania: Amer. Ceramic Soc., Jour. 2, p. 685-693, illus., 1919; discussion, p. 693-694. Clays of the Cambrian and Ordovician rocks are described. All are residual. Few details are included.

HICKOK, WILLIAM ORVILLE, 4th. See also Stone, Ralph Walter, 35, 36.

1. The genesis of the ore deposits at Cornwall [Lebanon County] Penna.: M.S. thesis, Yale Univ., 1929.
2. Iron ores, present and future: Pa. Topog. Geol. Survey [4th ser.], Bull. 104, 6 p. (#), 1932. A generalized review of the iron ore reserves of the world and the Commonwealth. No details are given.
3. Analyses of natural gas and petroleum, *in* Contributions to the oil and gas geology of western Pennsylvania: Pa. Geol. Survey 4th ser., M 19, p. 89-94, 1933.
4. (and Willard, Bradford). Dinosaur foot tracks near Yocumtown, York County, Pa.: Pa. Acad. Sci., Proc. 7, p. 55-58, illus., 1933. Tracks of *Grallator tenuis* and *Anchisauripus sillimani* are described from Triassic sandstone. Restora-

tion is attempted. Correlation with the Connecticut Valley Triassic is suggested.

5. Erosion surfaces in south-central Pennsylvania: Amer. Jour. Sci. 5th ser. 25, p. 101-122, illus., 1933. A large number of erosion surfaces, based on hilltop elevations and stream knickpoints, are proposed. Terraces result from the upstream migration of the knickpoints. Wind gap-bottoms are at levels of the various erosion surfaces also.
6. (and Graeber, Charles Karsner). [Geology of the Cornwall, Lebanon County area]: Field Conf. of Pa. Geologists, 3rd, p. 3-5 (#), illus., Harrisburg, 1933. This is a mimeographed road log from Harrisburg to Cornwall and back. No details are given.
7. The iron ore deposits at Cornwall [Lebanon County], Pa.: Economic Geology 28, p. 193-255, illus., 1933; discussion with title, Ferric-ferrous ratio in contact metamorphic deposits, by S. G. Lasky, 29, p. 203-206, illus., 1934. Diabase of late Triassic age has intruded folded Paleozoic limestones. Magnetite is one of many contact metamorphic minerals. The petrology of the diabase is studied. The ore was emplaced after the diabase had intruded and started to cool.
8. (and Stone, Ralph Walter). [Geology of] area southwest of Harrisburg, trip B *of* Pa. Topog. Geol. Survey Centennial Celebration [Fieldtrip]: p. 12-15 (#), [Harrisburg], 1936. This is a mimeographed road log for Precambrian, Cambrian, Ordovician, and Triassic rocks in Cumberland, Adams, and York counties. No details are included.
9. Iron ores of Pennsylvania: Pa. Geol. Survey 4th ser., M 18-B, 21 p., 1939. This is a generalized discussion of hematite, limonite, magnetite, and iron carbonate deposits in the Commonwealth. Analyses are given.
10. (and Moyer, Forrest Theodore). Geology and mineral resources of Fayette County, Pennsylvania: Pa. Geol. Survey 4th ser., C 26, xi, 530 p., illus. incl. atlas, 1940. A complete geologic description of the area is given. Devonian-Permian rocks are at the surface. A peridotite dike is described. Sections are measured and fossils are listed; analyses are made. Coal, oil, and gas are the chief mineral resources; limestone, sandstone, clay, shale, fire clay, sand and gravel, and iron ore are minor products.

HIETANEN, ANNA MARTTA. See also Cloos, Ernst, 3.

1. Appalakien rakennepiirteita: Geografiska Sällskapets i Finland, Argang 53, no. 1-2 [Terra], p. 1-33, illus.; English summary, p. 33-34, Helsinki, 1941. This is a discussion of the folds and faults of the Commonwealth. Much emphasis is placed on the structural petrology and metamorphism of the southeastern portion.
2. Über einige Strukturzüge der Appalachen. Geol. Rundschau 32, heft 4/5, Suomi Finnlandheft, p. 672-692, illus., Stuttgart, 1942. A review of the structural geology of the Appalachians is given. The metamorphic rocks of the southeastern counties are especially considered. Petrofabric and structural fabric diagrams are included.

HIGGINS, D. F. See Ashley, George Hall, 28.

HILDRETH, SAMUEL PRESCOTT, 1783-1863.

1. Observations on the bituminous coal deposits of the valley of the Ohio, and the accompanying rock strata—with notices of the fossil organic remains and the relics of vegetable and animal bodies, illustrated by a geological map: Amer. Jour. Sci. 29, p. 1-154, illus. incl. geol. map, 1835; correction, p. iv, 1835. A rambling but complete description of the topography of southwestern Pennsylvania is given. [Pennsylvanian] rocks are described, as is the coal.

HILL, E. G. See Fettke, Charles Reinhard, 6.

HILL, FRANK A., 1858-1915. See also Winslow, Arthur, 2.

1. Description of the Wyoming buried valley between Pittston and Kingston [Luzerne County]: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 637-647, illus., 1886. Susquehanna River flows in a drift-filled valley of an earlier stream. Its course is mapped by borings and mine shafts. It is 150-200 feet below the present Susquehanna River.
2. Geology and mining in the northern field of Pennsylvania: Amer. Inst. Mining Engineers, Trans. 15, p. 699-707, 1887; discussion by C. A. Ashburner and

P. Frazer, Jr., p. 707. A very cursory review of the coal-bearing formations and the structure of the area is given. The topography and economic geography is included also.

3. Report on the anthracite region: Pa. Geol. Survey 2nd, Ann. Rpt. 1886, Part 3, p. 919-1303, illus. incl. atlas, 1887. A detailed discussion of the anthracite coal fields is given. Stratigraphy and structure are discussed in detail. Sections are measured; analyses are given. The Southern field is not considered. Only [Pennsylvanian] rocks are present.
4. Report on the metallic paint ores along the Lehigh River [Carbon County]: Pa. Geol. Survey 2nd, Ann. Rpt. 1886, Part 4, p. 1386-1408, illus., 1887. A zone of hematitic material occurs near the top of the Oriskany sandstone. It is about 2 feet thick and is locally economic. Sections are measured westward from Lehigh Gap.
5. (edited by J. Peter Lesley). Notes on the Mehoopeny coal-field [Wyoming County]: Pa. Geol. Survey 2nd, G 7, p. 405-410, illus., 1889. A coal bed lies within a conglomerate unit and its age is uncertain. It is uncertain whether the coal is in the Pottsville or below it. Measured sections are given.
6. Geological writings of Charles Albert Ashburner [1854-1889]: Geol. Soc. Amer., Bull. 5, p. 564-567, 1894.

HILLS, JOHN MOORE

1. River coals of eastern Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 103, 33 p. (#), 1931. Anthracite fragments are discussed as economic deposits in the silts of the large eastern rivers. Rate of movement, size, quality, and origin are all discussed.
2. The structure of the Allentown limestone: B.S. thesis, Lafayette College, 1931.
3. The insoluble residues of the Cambro-Ordovician limestones of the Lehigh Valley [eastern], Pa.: Jour. Sedimentary Petrology 5, p. 123-132, illus., 1935. Shale, sand, chert, dolocasts, Foraminifera, and several minor constituents are the chief insoluble residues. No heavy minerals are present, and proportions of the above must be used to subdivide the Cambro-Ordovician section.

HINTZE, FERDINAND FRIS, JR.

1. Age of the Martinsburg shale as interpreted from its structural and stratigraphical relations in eastern Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 29, p. 94-95, 1918.

HITCHCOCK, CHARLES HENRY. See also Hall, Charles Edward, 7.

1. Synchronism of coal beds in the New England and western United States coal basins: Amer. Assoc. Adv. Sci., Proc. 14, p. 138-143, 1861. The coal formations of the Commonwealth are compared with others on a paleobotanical basis.
2. Fossils of the Potsdam group in North America: Portland [Me.] Soc. Nat. Hist., Proc. 1, p. 87-90, 1862. A list of [Cambrian] fossils and localities includes *Scolithus linearis, Obolus* sp., and *Lingula prima* from the Commonwealth. No specific locations are given.
3. The geological distribution of petroleum in North America: British Assoc. Adv. Sci., Rpt. 36, p. sec. 55-57, London, 1867; Geological Mag. 4, p. 34-37, London, 1867. This is a discussion of the various physical conditions under which petroleum can occur. Most examples are taken from the Commonwealth.
4. The coal areas of the United States of America: Geological Mag. 10, p. 99-101, London, 1873. A review of the coal areas of the nation includes the Commonwealth of which over 12,400 square miles are underlain by coal.
5. (and Blake, William Phipps). Geological map of the United States. To accompany the report of R. W. Raymond, U. S. Commissioner of Mining Statistics: Scale, 1:5,700,000, [Washington, D. C.?] 1873.
6. (and Blake, William Phipps). Geological map of the United States: U. S. Census 9th, Statistical Atlas, pl. 13-14, Scale, 1:7,000,000, 1874; discussion, Amer. Jour. Sci. 3rd ser. 6, p. 64-66, 1873.
7. The coal measures of the United States: U. S. Census 9th, Statistical Atlas, p. 12-14, illus., 1874. A very generalized description of the coal fields includes the Commonwealth. The text accompanies a plate with maps.
8. The Atlantic system of mountains [abs.]: Appalachia 1, p. 11-14, 1876. A generalized account of the [Precambrian] rocks and history of the [Piedmont and Blue Ridge] is given. The Commonwealth is included.

9. The geological map of the United States: Amer. Inst. Mining Engineers, Trans. 15, p. 465-488, illus. incl. geol. map, 1886. In an exhortation for an international color scheme for maps, a map of scale 1:7,000,000 is given as an example.
10. The discovery of fossil tracks in the Triassic of York Co., Pa. [abs.]: Amer. Assoc. Adv. Sci., Proc. 37, p. 186, 1889.

HOBBS, WILLIAM HERBERT. See also Stose, George Willis, 20.

1. Lineaments of the Atlantic border region: Internatl. Geog. Cong. 8th, U. S. 1904, Rpt., p. 193-203, illus., 1905. Large, regional lineaments are outlined for the eastern United States, and some are noticed in the Commonwealth. They are: (1) Fall line, (2) Delaware line, (3) Susquehanna line, and (4) Potomac line. All are parallel but the Fall line, and all are attributed to large-scale weaknesses or joints in the crust.
2. Correspondence between the Gondwana System of Hindustan and the Newark System of the eastern United States [abs.]: Geol. Soc. Amer., Bull. 34, p. 82-83, 1923; discussions, p. 83-85.
3. Memorial to Frank Leverett [1859-1943]: Geol. Soc. Amer., Proc. 1943, p. 183-193, port., 1944.

HODGE, JAMES THATCHER, 1816-1871.

1. (and Trego, Charles B.): [Supposed unconformity in Savage Mountain, Somerset County] [abs.]: Amer. Jour. Sci. 41, p. 186, 1841; Assoc. Amer. Geologists, [Proc.] Rpt. 2nd sess., p. 38, 1843.
2. Report of the Lycoming [County] Iron and Coal Company: Mining Mag. 1, p. 455-468, New York, 1853. A brief review of the structure and mineral deposits is given. The mineral resources include iron, coal, fire clay, and building stone. The iron ore and coal are analyzed.

HODSON, FLOYD

1. The origin of bedded Pennsylvanian fire clays in the United States: M.A. thesis, Cornell Univ., 1922; Amer. Ceramic Soc., Jour. 10, p. 721-746, illus., 1927. Evidence is given to support a sedimentary origin from swamps in which carbonic and organic acids had leached out the iron and alkalies. Some examples are from Commonwealth.

HÖFFER, HANS

1. Die Kohlen und Eisenerz-Lagerstatten Nord Amerikas . . .: Oesterreichische Commission fur Weltaustellung in Philadelphia 1876, H. 8, 260 p., illus., Vienna, 1878. Coal and iron occurrences and reserves are reviewed for the whole nation. The Commonwealth is, of course, included. No new data are given.

HOFFACKER, BENJAMIN F.

1. The western extent of the Catskill red beds facies in western Pennsylvania: Thesis, Univ. Pittsburgh, [no date].

HOGG, J. B.

1. New map of the coal fields of Somerset County, Pennsylvania and adjacent territory showing all coal mines: Scale, 1 inch equals about 2 miles, Connellsville, Pa., 1909.

HOLDEN, EDWARD FULLER, 1901-1925.

1. Limonite pseudomorphous after pyrite from York County, Pa.: Amer. Mineralogist 4, p. 68-69, 1919. Small cubes are scattered around the countryside in great profusion. They are from the local [Ordovician] limestone. Only cubes are known.

HOLDER, CHARLES FREDERICK

1. Spencer Fullerton Baird, zoölogist, 1823-1877, *in* Leading American Men of Science, by D. S. Jordan, ed.: p. 269-281, port., Holt and Co., New York, 1910.

HOLLAND, WILBUR C.

1. The ostracods of the Nineveh limestone of [Greene County] Pennsylvania and West Virginia: M.S. thesis, Univ. Pittsburgh, 1933; Carnegie Museum, Annals 22, p. 343-350, illus., 1934. *Whiplella deltoidea*, *W. magnitata*, *W. ninevehensis*, and *W. ovata* are described and illustrated from the Permian near Nineveh.

HOLLAND, WILLIAM JACOB

1. A preliminary account of the Pleistocene fauna discovered in a cave opened at Frankstown [Blair County], Pa. in April and May, 1907: Carnegie Museum, Annals 4, p. 228-233, illus., 1908; Internatl. Zool. Cong. 7th, Boston 1907,

Proc., p. 748-752, 1912. A description and illustration of a cave is accompanied by a list of the fauna. Mammals, birds, and reptiles are present. They are Quaternary.

HOLLICK, CHARLES ARTHUR

1. John Strong Newberry . . . [1822-1892]: U. S. Geol. Survey, Mon. 26, p. 15-20, 1895.

HOLLISTER, GEORGE BUELL

1. Physiographic features of the Susquehanna basin: U. S. Geol. Survey, Water-Supply Paper 108, p. 9-18, 1904. A review of the physiography of northern Pennsylvania and its connection with the Susquehanna River is given. No new geology is included.

HONESS, ARTHUR PHARAOH, 1887-1942. See also Bonine, Chesleigh Arthur, 2; Krynine, Paul Dimitri, 8.

1. (and Graeber, Charles Karsner). A new occurrence of an igneous dike in [Indiana County] southwestern Pennsylvania: Amer. Jour. Sci. 5th ser. 7, p. 313-315, 1924. A porphyritic peridotite encountered at 200 feet in depth is described. It extends in an east-west direction. It cuts the Lower Freeport coal. It is 100 feet long and 45 feet wide; it contains xenoliths of country rock. Serpentine pseudomorphs after olivine, and biotite phenocrysts without feldspar make the rock a mica peridotite.
2. (and Graeber, Charles Karsner). Petrography of the mica peridotite dike at Dixonville [Indiana County], Pennsylvania: Amer. Jour. Sci. 5th ser. 12, p. 484-494, illus., 1926; Pa. State College Mineral Industry Experiment Sta., Bull. 2, 16 p., illus., 1926. The dike is a hard, compact, dark-gray to greenish gray, porphyritic, mica peridotite. It has invaded the Allegheny Formation. The coal is slightly coked. The dike is altered almost completely to serpentine and has been carbonized. An analysis is included. Its relationship to similar dikes in the Commonwealth is discussed.
3. A study of the microscopic characteristics of Pennsylvania oil sands, with special reference to porosity determinations: Pa. State College Mineral Industry Experiment Sta., Bull. 9, p. 27-46, illus., 1930. Tables show petrographic characters of 16 sand beds in the Commonwealth. The varieties and origins of cement are discussed at length. The porosity is greatly affected by temperature. Microscopic examination should be made before the various physical tests are applied. Photomicrographs are included.
4. (and Williams, Francis Jesse). Dickite from [Schuylkill-Northumberland Counties] Pennsylvania: Amer. Mineralogist 20, p. 462-466, 1935; Pa. State College Mineral Industry Experiment Sta., Tech. Paper 18, 1935. Two localities are mentioned. The mineral is associated with coal. Its optical, chemical, and x-ray data are summarized.
5. (and Jeffries, Charles David). Authigenic albite from the Lowville limestone at Bellefonte [Centre County], Pennsylvania: Jour. Sedimentary Petrology 10, p. 12-18, illus., 1940; Pa. State College Mineral Industry Experiment Sta., Tech. Paper 53, 1940. Heavy mineral analyses of the Ordovician limestone have revealed much authigenic albite. This is very unusual, and its origin is speculated upon.

HONESS, CHARLES W.

1. Studies in the Upper Devonian-Lower Carboniferous strata of the Appalachian sea: M.A. thesis, Cornell Univ., 1916.

HOPKINS, THOMAS CRAMER. See also Smallwood, W. Martin, 1.

1. Brownstones of Pennsylvania: U. S. Geol. Survey, Ann. Rpt. 18, Part 5, p. 1025-1043, 1897. The red sandstones of the Triassic areas are described and analyzed. They are described mineralogically, structurally, and texturally. Individual deposits are described. The Mauch Chunk red sandstones are also mentioned.
2. The building materials of Pennsylvania—[Part] 1, Brownstones: Pa. State College, Ann. Rpt. 1896 app., 122 p., illus., 1897; Stone 15, p. 147-155, 257-265, 364-369, illus., 1897. Brownstone occurs in the Triassic sandstones and the Mauch Chunk Formation. The general features are described, as are local features in individual quarries. The rock was once used extensively around the country as a building stone.

3. The geology of Pennsylvania: Mining Bull. 3, p. 39-48, 1897. A brief description of the geologic history of the Commonwealth from the [Precambrian] to [Triassic] and Quaternary is given.
4. Clays and clay industries of Pennsylvania. [Part] 1, . . . Western Pennsylvania: Pa. State College, Ann. Rpt. 1897 app., 183 p., illus., 1898; [Part] 2, . . . Southeastern Pennsylvania (in part), Ann. Rpt. 1898-99, part 1 app., 76 p., illus., 1900; [Part] 3, . . . the Great Valley and South Mountain areas, Ann. Rpt. 1899-1900, part 1 app., 45 p., illus., 1900. A discussion of the different kinds of clay and general features is followed by descriptions of individual deposits. Notes on other economic products are also included.
5. Some feldspars in serpentine, southeastern Pennsylvania [abs.]: Amer. Assoc. Adv. Sci., Proc. 47, p. 293-294, 1898; Science ns 8, p. 468, 1898; Amer. Geologist 22, p. 256, 1898.
6. Feldspars and kaolins of southeastern Pennsylvania: Franklin Inst., Jour. 148, p. 1-31, illus., 1899. A general discussion of feldspar and kaolin is followed by descriptions of occurrences in Delaware and Chester Counties.
7. Cambro-Silurian limonite ores of Pennsylvania: Geol. Soc. Amer., Bull. 11, p. 475-502, illus., 1900. Various types of occurrences are described. Analyses are included. For the most part they are residual deposits in the clay from dissolved limestone. The origin of the iron and its concentration are discussed in detail. The chief concentrating agent was meteoric water.
8. Conshohocken [Montgomery County] plastic clays: Geol. Soc. Amer., Bull. 10, p. 480-484, illus., 1900. Clay rests in cavities and irregularities on blue [Ordovician] limestone. It resembles plastic clays of [Tertiary] age in New Jersey. Lignite is interbedded. Several commercial clay pits are described.
9. Limonite ores of Pennsylvania: Mines and Minerals 21, p. 97-100, illus., 1900. This is a review of the geologic conditions and occurrence of the ores. Most of it is residual concentration from limestone. Limonite (goethite) and turgite are the common minerals.
10. The white clays of southeastern Pennsylvania: Engineering and Mining Jour. 70, p. 131, 1900. Kaolin-like clays are described from along the Blue Ridge and near Philadelphia. The clays are a result of decomposition of hydromica slates interstratified in Cambro-Ordovician limestones.
11. A short discussion of the origin of the Coal Measures fire clays: Amer. Geologist 28, p. 47-51, 1901; reprinted with title, Fire clays of the Coal Measures: Mines and Minerals 22, p. 296, 1902. A general discussion includes examples from the Commonwealth. They are considered as transported clays which were reduced before deposition.
12. (and Smallwood, W. Martin). Some anticlinal folds [Erie County] [abs.]: Geol. Soc. Amer., Bull. 13, p. 530, 1903.

HORN, GEORGE HENRY, 1840-1897.

1. Notes on some coleopterous remains from the bone cave at Port Kennedy. [Montgomery County], Pa.: Amer. Entomological Soc., Trans. 5, p. 241-245, 1876. Nine genera and eleven species of beetles are described from the clay in the cave. Most are fragmental. The age is Pleistocene.

HORTON, GEORGE F.

1. Geology [Bradford County]: Medical Soc. Pa., Trans. ns 4, p. 48-54, illus. geol. map, 1859. A complete, but generalized, description is given. [Devonian] to [Pennsylvanian] rocks are mapped. Fossils are listed.

HOSKINSON, W. S.

1. (and Brunner, D. B.). Stilbite, [Part] 6 *of* Mineralogical notes [Berks County]: Amer. Chemical Jour. 6, p. 414, 1885. The mineral is described and analyzed from Fegley's mine.

HOSLER, RUSH N.

1. The northern Appalachian coal field: Engineering and Mining Jour. 89, p. 1122-1124, 1910. A review of the bituminous coal-bearing strata of the Commonwealth is given.

HOTZ, PRESTON E.

1. Petrology and habit of some diabase sheets in southeastern Pennsylvania: Ph.D. thesis, Princeton Univ., 81 p. (#), illus., 1949; U. S. Geol. Survey,

Rpt. Open File no. 30, 1949. The petrology of the diabase is examined in detail. The varieties are due to magmatic differentiation. Most of the evidence is from York County. The diabase's geographic control by fracturing, mostly in Triassic rocks, is discussed.

HOVEY, EDMUND OTIS. See also Hadley, Arthur Twining, 2.

1. Microscopic structure of siliceous oölite [Centre County]: Geol. Soc. Amer., Bull. 5, p. 627-629, illus., 1894. Petrographic details of the [Ordovician] oolites are given. The nucleus is quartz which is then followed by colorless and light-brown concentric rings. Chalcedony is between the oolites as the matrix.

HOVEY, HORACE CARTER, 1833-1914.

1. The life and work of James Hall [1811-1898], LL.D.: Amer. Geologist 23, p. 137-168, port., 1899.

HOWARD, CHARLES SPAULDING. See Collins, William Dennis, 1; Hall, George Martin, 1; Piper, Arthur Maine, 1.

HOWELL, BENJAMIN FRANKLIN. See also Resser, Charles Elmer, 3; Ruedemann, Rudolph, 3.

1. *"Scolithus verticalis"* Hall is *Monocraterion clintonense* (James) [Juniata County] [abs.]: Geol. Soc. Amer., Bull. 51, p. 1972, 1940.
2. Burrows of *Skolithos* and *Planolites* in the Cambrian Hardyston sandstone at Reading [Berks County], Pennsylvania: Wagner Free Inst. Sci., Pub. 3, 33 p., illus., 1943. A general discussion of the vertical worm tubes is given. *Scolithus linearis* and *Planolites montalto* are described from Mt. Penn in the Hardyston sandstone. The occurrence of these and other worm genera throughout the Commonwealth is discussed.
3. New Upper Cambrian faunas from [Bucks County] Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 54, p. 1831, 1943.
4. A new *Skolithos* from the Cambrian Hardyston formation of [Northampton County] Pennsylvania: Wagner Free Inst. Sci., Bull. 19, no. 4, p. 41-46, illus., 1944. The burrows of *Scolithus magnus* are described. They are much larger than *S. linearis,* the common species.
5. (Chairman, and others). Correlation of the Cambrian formations of North America: Geol. Soc. Amer., Bull. 55, p. 993-1004, illus., 1944. A time-rock correlation chart compares the Cambrian of the Commonwealth with the rest of the United States. Brief bibliographic references are given. Fossils are listed.
6. Memorial to Charles Elmer Resser [1889-1943]: Geol. Soc. Amer., Proc. 1943, p. 217-223, port., 1944.
7. A new Ordovician asaphid from [Franklin County] Pennsylvania: Acad. Nat. Sci. Phila., Notulae Naturae 164, 3 p., illus., 1946. *Onchometopus grandis* is described from the Middle Ordovician Chambersburg limestone. The test is covered with large puncta.
8. New *Microspongia* from the Devonian of [Perry County] Pennsylvania: Wagner Free Inst. Sci., Bull. 21, no. 1, 4 p., illus., 1946. *Microspongia sphaerodalis grandis* is described from the New Scotland limestone at Landisberg. This one is larger than other members of the species.
9. Silurian *Monocraterion clintonense* burrows showing the aperture [Perry-Juniata Counties] Pennsylvania: Wagner Free Inst. Sci., Bull. 21, p. 29-40, illus., 1946. Vertical worm tubes are described and illustrated from the Keefer sandstone. A discussion of the nomenclature of *Scolithus* and *Fucoides* is included.

HOWELL, EDWIN EUGENE, 1845-1911.

1. Description of the Mt. Joy [Adams County] meteorite: Amer. Jour. Sci. 3rd ser. 44, p. 415-416, illus., 1892. A physical and chemical description of the iron meteorite is given.

HOWELL, THOMAS J.

1. The geological distribution of North American forests: Popular Science Monthly 23, p. 517-524, 1883. A comparison of a forest map with a geological map of the United States (including the Commonwealth) shows a remarkable parallelism. The eastern Canadian forest trees are found on the higher

mountains in the Commonwealth. Those of the folded Paleozoic province seem to follow the same type of rock around to different parts of the province.

HSU, GIUN-TZE

1. A biographical sketch of Douglas Wilson Johnson, [1878-1944]: Geog. Soc. China, Jour. 14, p. 23-41, port., Peking, 1947 [in Chinese].

HUBBARD, GEORGE DAVID

1. Biographical sketch of George Frederick Wright [1838-1921]: Ohio Acad. Sci., Proc. 7, p. 243-247, 1923.

HUENE, FRIEDRICH VON

1. Reptilian and stegocephalian remains from the Triassic of [Chester County] Pennsylvania in the Cope collection: Amer. Museum Nat. Hist., Bull. 44, p. 561-574, illus., 1921. Illustrations and further definition of vertebrate teeth previously identified by Cope are given. They are from near Phoenixville. A possible pterosaur fragment is also discussed.
2. Notes on the age of the continental Triassic beds in North America, with remarks on some fossil vertebrates: U. S. Natl. Museum, Proc. 69, art. 18, 10 p., illus., 1926. This is a review of the status of Triassic rocks to date, including the Commonwealth. In Pennsylvania the beds are Middle Triassic in age, based on the vertebrate remains.

HUGHES, HARRY HERBERT. See also Stone, Ralph Walter, 29.

1. Freeport quadrangle [Allegheny, Armstrong, and Westmoreland Counties]—geology and mineral resources: Pa. Geol. Survey 4th ser., Topog. Geol. Atlas 36, 272 p., illus. incl. geol. map, 1933. A complete geologic description of the area is given. Pennsylvanian and Quaternary rocks are at the surface. Devonian-Mississippian rocks are described from wells. Sections are measured; analyses are made. Coal, petroleum, and gas are the major resources; many minor products are present.

HULL, THOMAS EDWARD

1. Ground water production from alluvium and glacial gravels in the Pittsburg [Allegheny County] district: M.S. thesis, Univ. Pittsburgh, 1948.

HUNGERFORD, AUSTIN N. See Ashburner, Charles Albert, 24.

HUNT, E. See Cameron, N. S., 1.

HUNT, THOMAS STERRY, 1826-1892. See also Blandy, John F., 2; Genth, Frederick Augustus, 9; Pechin, Edmund C., 1; Prime, Frederick, Jr., 1.

1. Sur les petroles de l'Amerique du Nord: Soc. géol. France, Bull. 2nd ser. 24, p. 570-573, Paris, 1867. A review of petroleum-bearing rocks in the United States, includes the Commonwealth. An indigenous origin in the Devonian is considered for the oil.
2. The geognosy of the Appalachians and the origin of crystalline rocks: Amer. Naturalist 5, p. 450-509, 1871; Amer. Assoc. Adv. Sci., Proc. 20, p. 1-59, 1872; abridged, Nature 5, p. 15-17, 1871. A regional description of the origin and history of the Older Appalachian metamorphic rocks includes southeastern Pennsylvania. The [Precambrian]-[Cambrian] unconformity is recognized. Extreme metamorphism is described as the origin of the crystalline rocks.
3. History of the names Cambrian and Silurian in geology: Canadian Naturalist ns 6, p. 281-312, 417-448, 1872; Geological Mag. 10, p. 385-395, 453-461, 504-510, 561-566, London, 1873. A review of the literature of the subject is given. The Commonwealth is included.
4. The paleogeography of the North-American continent: Amer. Geog. Soc., Jour. 4, p. 416-431, 1874. A generalized description of the historical geology of the eastern United States, includes the Commonwealth.
5. A new ore of copper [Berks County] and its metallurgy: Amer. Inst. Mining Engineers, Trans. 4, p. 325-328, 1876. Venerite from the Jones iron mine is described physically and chemically. It is a chlorite.
6. The Cornwall iron mine [Lebanon County] and some related deposits in Pennsylvania: Amer. Inst. Mining Engineers, Trans. 4, p. 319-325, 1876. The magnetic ores are considered [Cambrian] in age and appear associated with the Triassic rocks only because they have been protected from erosion; they have been eroded away from everywhere else.
7. Geology of eastern Pennsylvania: Amer. Assoc. Adv. Sci., Proc. 25, p. 208-212, 1877. The crystalline rocks are described geographically and petrologically.

He recognizes them as [Precambrian].

8. On the geology of the Eozoic rocks of North America [abs.]: Boston Soc. Nat. Hist., Proc. 19, p. 275-279, 1878.
9. Special report on the trap dykes and Azoic rocks of southeastern Pennsylvania, Part 1, Historical introduction: Pa. Geol. Survey 2nd, E, xxi, 253 p., 1878. A historical development of the earlier ideas on the [Precambrian] and lower Paleozoic rocks of the area is given. Each earlier author's correlations are discussed and compared to Canadian and southern areas.
10. The history of some pre-Cambrian rocks in America and Europe: Amer. Jour. Sci. 3rd ser. 19, p. 268-283, 1879; Canadian Naturalist ns 9, p. 257-275, 1880; Amer. Assoc. Adv. Sci., Proc. 28, p. 279-296, 1880. The world wide argument of the Precambrian schists and gneisses being primarily metamorphosed sedimentary rocks is reviewed and compared with the argument that Precambrian rocks are primarily igneous with some metamorphism having occurred. Examples are taken from the Commonwealth.
11. A historical account of the Taconic question in geology, with a discussion of the relations of the Taconian Series to the older crystallines and to the Cambrian rocks: Roy. Soc. Canada, Proc. and Trans. 1, sec. 4, p. 217-270, 1883. The Taconic [Cambrian-Ordovician] problem is reviewed, and examples from the Commonwealth are used. The Cambro-Ordovician rocks are considered to be Lower Taconic.
12. The decay of rocks geologically considered: Amer. Jour. Sci. 3rd ser. 26, p. 190-213, 1883. Evidence is drawn from Pennsylvania and elsewhere, that subaerial erosion has always taken place. The iron ores of the Commonwealth are considered as having come from subaerially weathered pre-existing rocks. The amount of weathering has been negligible since glacial times.
13. The geological history of serpentines, including notes on pre-Cambrian rocks: Roy. Soc. Canada, Proc. and Trans. 1, sec. 4, p. 165-215, 1883. A general treatise on these rocks includes descriptions of examples from the southeastern counties. They are sedimentary in origin.
14. Biographical notice of Benjamin Silliman [Jr.], [1817-1885]: Amer. Inst. Mining Engineers, Trans. 13, p. 782-785, 1885.
15. Mineral physiology and physiography: xvii, 710 p., illus., Casino, Boston, 1886. This is a textbook of metamorphic geology, in which the serpentines of the Commonwealth are discussed.
16. The iron ores of the United States: Amer. Inst. Mining Engineers, Trans. 19, p. 3-17, 1891; Engineering and Mining Jour. 50, p. 601-602, 622-624, 1890; Iron and Steel Inst., Jour. 1890, II, p. 628-644, 1891. A brief review of the various iron sources in the Commonwealth is included.

HUNTINGDON, ELLSWORTH

1. William Morris Davis, [1850-], geographer: Geog. Soc. Phila., Bull. 10, p. 224-234, port., 1912.

HUNTLEY, STIRLING. See Johnson, Roswell Hill, 1.

HURLBUT, CORNELIUS S., JR. See Fraser, Donald McCoy, 9.

HUTCHINS, THOMAS

1. On a cascade near the Ohiopile Falls of the Youghiogeny, twelve miles from Uniontown, Fayette County, Pennsylvania: Amer. Phil. Soc., Trans. 2, p. 50, 1786. [Mississippian] limestone forms a ledge for the cascade.

IHLSENG, MAGNUS COLBJORN

1. A phosphate prospect in [Juniata County] Pennsylvania: U. S. Geol. Survey, Ann. Rpt. 17, Part 3, p. 955-957, 1896. A belt of phosphate rocks occurs along the Oriskany-Helderberg Formation contact. The several seams are obviously bedded, but appear to be conformable. There are: (1) white, vesicular, and soft pebbles, (2) red concretionary nodules, and (3) blue limestone which is odoriferous. The deposit is not economic near Reed's Gap where it is best developed.
2. The road-making materials of Pennsylvania: Pa. Dept. Agriculture, Bull. 69, 104 p., illus., 1900. Petrographic studies of various kinds of rocks for road-building purposes are given. Most of the work is devoted to physical properties in connection with crushing, wear, etc. Generalized locations of material are included.

IHNE, F. W.

1. Graphite in the United States: Mining Science 60, p. 297-298, 316-318, 343-346, illus., 1909. A general review of the material includes the Commonwealth, which at that time was the second largest producer of flake graphite. Deposits in Berks and Chester Counties are described.

INGERSOLL, T. DWIGHT

1. Glacial origin of Presque Isle, Lake Erie [Erie County]: Amer. Naturalist 19, p. 865-867, 1885. Glacial drift was deposited farther west in Ohio and is being moved eastward to Pennsylvania by currents and waves. Presque Isle has changed shape only slightly in historical time.

INGERSON, FRED EARL

1. Albite trends in some rocks of the Piedmont [Lancaster County]: Amer. Jour. Sci. 5th ser. 35-A, p. 127-141, illus., 1938. Oriented albite crystals in the metamorphic Peters Creek schist are not relict minerals, but are controlled by the crystal lattice which was determined during late hydrothermal activity. Petrofabric diagrams are included.

INGHAM, ALBERT IRWIN. See also Ebright, John Richard, 1.

1. Geologic structures of the Northern Plateaus region of Pennsylvania: Pa. Geol. Survey [4th ser.], Bull. 108. Map, scale, 1 in. to 6 mi., 1934. This is a structure-contour map on the Oriskany sandstone. Tabular data are given as text.
2. Geology of the McDonald and adjacent oil fields, Allegheny and Washington Counties, Pennsylvania—Part 1: Pa. Geol. Survey 4th ser., M-29, p. viii, 1-40, illus., 1949. McDonald, McCurdy, Venice, Hopper, and the Moon Run-Crafton oil fields are described. Devonian-Pennsylvanian rocks are described. Production is from Devonian and Mississippian sands and is controlled primarily by porosity traps.
3. The McDonald oil field, Allegheny and Washington Counties, Pennsylvania: Producers Monthly 13, no. 4, p. 29-39, illus., 1949. This field produces from sands in the Conewango group of the Upper Devonian. Cross synclines have created domes in anticlines, although the petroleum comes primarily from stratigraphic traps.

INGHAM, WILLIAM M.

1. A general index of the final summary report of the geology of Pennsylvania: Pa. Geol. Survey 2nd, xxx, 98 p., Harrisburg, 1895. The report is indexed to areas, subject, and geologic features.
2. A list and brief guide to the Publications of the [2nd] Pennsylvania Geological Survey, 1874-1895: xxx, Harrisburg, 1896.

ITTER, HARRY AUGUSTUS, 1899-1940.

1. The geomorphology of the Wyoming-Lackawanna region [Lackawanna-Luzerne Counties]: Pa. Geol. Survey 4th ser., G-9, ix, 82 p., illus., 1938; also as separate, i. 87 p., illus., Easton, Wertley Press, 1936. This is a detailed description of the various geomorphic features with great emphasis on the glacial features. Various drainage changes are discussed, primarily that of the Susquehanna River. Terraces, kames, moraines, drift, potholes, buried valleys and many minor glacial features are described. A general discussion of Appalachian drainage is included, involving the peneplains and gaps.

JACKSON, ALVIN M.

1. Petrography of the Homewood sandstone, Fayette Co., Pennsylvania: Thesis, Northwestern Univ., 1935.

JACKSON, CHARLES THOMAS, 1805-1880. See also Rogers, Henry Darwin, 19; Teschemacher, James Englebert, 1.

1. Ridgway Farm and Loan Co's property [Elk County]—geological report: Mining Mag. 7, p. 174-184, New York, 1856. The coals of the area are described and analyzed.
2. [The bituminous-coal formation of Elk County] [abs.]: Boston Soc. Nat. Hist., Proc. 6, p. 16-18, 1859.

JACKSON, ROBERT TRACY

1. Charles Emerson Beecher [1856-1904]: Amer. Naturalist 38, p. 407-426, port., 1904.

JAMES, JAY R.

1. Productive limits of the Speechley sand in Pennsylvania: M.S. thesis, Univ. Pittsburgh, 1938.

JAMES, JOSEPH FRANCIS, 1857-1897. See also Walcott, Charles Doolittle, 2.

1. Studies in problematic organisms—the genus *Scolithus:* Geol. Soc. Amer., Bull. 3, p. 32-44, illus., 1892. A review of the ideas about this "animal" is presented. It is known extensively from the Cambrian rocks in the Commonwealth. Many species are recorded, many of which seem invalid.
2. Remarks on the genus *Arthrophycus* Hall [Mifflin County] Cincinnati Soc. Nat. Hist., Jour. 16, p. 82-86, 1893. The genus *Arthrophycus* appears in the literature simultaneous with the synonym *Harlania.* The former is given priority because it was in print, but not published, several years before *Harlania* appeared.
3. Studies in problematic organisms—the genus *Fucoides:* Cincinnatti Soc. Nat. Hist., Jour. 16, p. 62-81, 1893. A treatise on the use and origin of the terms for this genus includes a discussion of *Arthrophycus* from Mifflin County.

JANDORF, MORTON LEHMAYER

1. Preliminary report on the York Valley limestone belt in York County: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1910-12, p. 50-129, illus. incl. geol. map, 1912. The valley is composed of Cambrian [and Ordovician] limestones. No attempt at stratigraphic interpretation is made. Fossils are listed. The physical and chemical properties are described. Many different minerals are found disseminated and in veins; they are listed.
2. Copper in York County, Pennsylvania: Mining Science Press 106, p. 346-347, 1913. Chalcocite occurs disseminated in Triassic sandstone. Secondary enrichment and oxidation minerals are also present. Plant fossils are replaced by the ore in places. The ore is thought to be epigenetic.
3. Unusual minerals in limestone near York [York County], Pa.: Amer. Mineralogist 5, p. 196, 1920. A siliceous dolomite in the Cambro-Ordovician limestone of the area contains small amounts of sphalerite associated with a series of alteration products. It seems unrelated to the diabase almost one mile away.

JEFFERIS, WILLIAM W. See also Rand, Thedore Dehon, 21.

1. A new corundum locality [Chester County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 280, 1881. A vein of blue corundum associated with culsageeite is reported from Serpentine Ridge in Newlin Township. Over 500 pounds have already been removed.
2. A new locality for amethyst [Chester County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 280, 1881. Well-crystallized, deep purple amethysts are reported from plowed fields in northern Newlin Township.
3. A new locality for fluorite [Chester County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 243, 1881. A massive fluorspar specimen has been found in the limestone near Howellville.
4. A peculiar twinned garnet [Chester County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 58, 1882. A twinned garnet is described in which one crystal fits loosely into a cavity of the larger one. It occurred near the Avondale garnet location.

JEFFRIES, CHARLES DAVID. See Honess, Arthur Pharoah, 5.

JEFFREY, EDWARD CHARLES

1. David Pearce Penhallow [1854-1910]: Botanical Gazette 51, p. 142-144, port., 1911.
2. Organization of Pennsylvania anthracite and the peat hypotheses of the origin of coal [abs.]: Geol. Soc. Amer., Bull. 33, p. 149, 1922.

JEWELL, WILSON

1. [Geology of Alleghany County]: Medical Soc. Pa., Trans. 4th ser. 2, p. 42-46. Medical Soc. Pa., Trans. ns 1, p. 125-126, illus. geol. map, 1856. [Precambrian-Quaternary] rocks are mapped. The alluvium is 40-50 feet thick; gneiss and a variety of minerals are mentioned, including steatite and diabase. No interpretation is included.

JILLSON, B. C.

1. [Geology of Alleghany County]: Medical Soc. Pa., Trans. 4th ser. 2, p. 42-46, illus. incl. geol. map, 1866. The [Pennsylvanian] rocks of the county are briefly described. The coal beds are described, as is an ancient glacial lake.

JILLSON, WILLARD ROUSE

1. Geologic reconnaissance through Kentucky, Ohio, Pennsylvania, and New York: 32 p., illus., Roberts Printing Co., Frankfort, Ky., 1949. Included is a brief resumé of the petroleum in the southwestern portion of the Commonwealth. No geologic details are included.

JOESTING, HENRY ROCHEMBEAU

1. (and Keller, Fred, Jr., and King, Elizabeth). Geologic implications of aeromagnetic survey of Clearfield-Phillipsburg area [Clearfield-Centre Counties], Pennsylvania: Amer. Assoc. Petroleum Geologists, Bull. 33, p. 1747-1766, illus. incl. geol. maps, 1949. Aeromagnetic maps are analyzed. The major features reflect the inhomogeneity of the basement rather than irregularities of the surface rocks. Basement trends diverge somewhat from surface structural trends. The basement is not deformed concordantly with the Paleozoic rocks. The basement is 19-22,000 feet deep, and may get deeper southeastward.

JOHNSON, DOUGLAS WILSON, 1878-1944. See also Barrell, Joseph, 5.

1. Blue book of the geological field excursion from New York to Gettysburg. 29 p., illus., Columbia University Press, New York, 1926. This is a detailed itinerary and guidebook for a field trip from New York City south into New Jersey, and from Easton (Northampton County) along the Great Valley to Gettysburg (Adams County). Geology and topography are explained at various points.
2. A theory of Appalachian geomorphic evolution: Jour. Geology 39, p. 497-508, illus., 1931. The consequent southeastward-drainage in the Commonwealth came about after inception on a Coastal Plain veneer which rested on the Schooley peneplain. The dendritic pattern could not have formed without the harder rock layers being covered, as there would always have been divides, no matter how level the peneplain originally was.
3. L'evolution du réseau fluvial dans la partie centrale des Appalaches: Annales de Géographie 40, p. 639-654, illus., Paris, 1931. The explanation of the superposed Appalachian rivers is given. The Coastal Plain sediments overlapped the Schooley peneplain, and stream courses were established before the uplift which caused superposition occurred.
4. Stream sculpture on the Atlantic slope, a study in the evolution of Appalachian rivers: 142 p., illus., Columbia University Press, New York, 1931. The presence of superposed streams, even-crested ridges, water gaps, and other physical features is attributed to regional peneplanation and Cretaceous cover, followed by uplift.
5. (and Bascom, Florence, and Sharp, Henry Staats). Geomorphology of the central Appalachians: Internatl. Geol. Cong., 16th, U. S. 1933, Guidebook 7, Excursion A-7, 50 p., illus., 1932. Description of the geomorphology from New York to Washington, D. C.; it includes eastern Pennsylvania. A generalized description of the various physiographic provinces is given. The route from Delaware Water Gap to Gettysburg via Harrisburg, is discussed.
6. Evolution of the drainage system of eastern North America: Cong. Internatl. Géog., 13th, Paris 1931, C.R. sec. 2, tome 2, fasc. 1, p. 600-606, illus., 1933; discussions, p. 606. A peneplain is envisioned which was covered by a thin veneer of Cretaceous marine sediments. Consequent drainage was established on this relatively flat surface. Later, uplift impressed consequent stream patterns on the deformed rocks below.
7. How rivers cut gateways through mountains: Scientific Monthly 38, p. 129-135, illus., 1934. A popular account of the formation of water gaps from uplifted peneplains is given. Examples from the Commonwealth are used.

JOHNSON, J. W.

1. [Lead ore and fossils near Sunbury, Northumberland County]: Boston Soc. Nat. Hist., Proc. 1, p. 43-44, 1844. Galena occurs in veins in limestone. Various fossils are also mentioned from the location. No descriptions are given.

JOHNSON, MEREDITH E.

1. Geologic structure of the Greensburg quadrangle [Westmoreland-Allegheny Counties] Penna.: Pa. Topog. Geol. Survey [4th ser.], Bull. 29, 4 p. (#), illus., 1922. Three anticlines and three synclines characterize the structure. They strike to the northeast. They are described according to the dips on the flanks and the angle of plunge.

2. New oil pool at Tidioute [Warren County] and gas pools near Corry [Erie County] and Meadville [Crawford County], Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 51, 4 p. (#), illus., 1922. Descriptions of the pools are given. The depths at which the sands were encountered is recorded.
3. Gas in Leidy Township, Clinton County, Penna.: Pa. Topog. Geol. Survey [4th ser.], Bull. 78, 7 p. (#), illus., 1923. Mississippian-Pennsylvanian rocks are at the surface; they are described. The structure is anticlines and synclines. The Kettle Creek gas field is on the Kettle Creek anticline. Production is from a sand near the top of the [Chemung] Formation. It is probably a lens.
4. Geologic structure of the Pittsburgh quadrangle [Allegheny County], Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 60, 5 p. (#), illus., 1923. Two major synclines and two major anticlines are described. Their influence on oil and gas is considered.
5. Oil and gas development in Pennsylvania in 1922: Pa. Topog. Geol. Survey [4th ser.], Bull. 66, 4 p. (#), 1923. A resumé of the wells is presented. Dry holes occurred in Lancaster, Chester, Westmoreland, Clearfield, Clinton, Warren, and Erie Counties. Production comes from Crawford, Warren, and Forest Counties.
6. Oil and gas sands in the north half of the Pittsburgh Quadrangle [Allegheny County], Penna.: Pa. Topog. Geol. Survey [4th ser.], Bull. 73, 10 p. (#) illus., 1923. This is a summary and description of oil- and gas-bearing rocks encountered in drill holes. The structure is analyzed. The sands are described.
7. Tidioute oil pool, Warren County, Pa.: Pa. Topog. Geol. Survey [4th ser.], Bull. 79, 17 p., (#) illus., 1923. The pool is described in detail. The wells are in Catskill Formation sands. The Queen sand is the producing sand. The structure is a series of domes on a monocline. Wildcat drilling nearby has limited the pool area. Logs of some wells are given.
8. Mineral resources of the Greensburg quadrangle [Westmoreland County], Pennsylvania: Pa. Geol. Survey 4th ser., Topog. Geol. Atlas 37, 162 p., illus. incl. geol. map, 1925. A complete geologic description of the quadrangle is given. Mississippian-Permian rocks are exposed. Coal, oil and gas, clay, limestone, and sandstone are the chief resources.
9. Pittsburgh quadrangle [Allegheny, Washington, and Westmoreland Counties], —geology and mineral resources: Pa. Geol. Survey 4th ser., Topog. Geol. Atlas 27, 236 p., illus. incl. geol. maps, [1929]. A complete geologic description of the area is given. Pennsylvanian rocks are at the surface. The structure is a series of broad folds. Sections are measured. Coal, petroleum, and gas are the chief economic products. Clay, shale, limestone, sandstone, and sand and gravel are also present.

JOHNSON, ROSWELL HILL

1. (and Huntley, Stirling). A resumé of the Pennsylvania-New York oil field: Mining and Metallurgy 158, sec. 23, 4 p., 1920; discussion by G. H. Ashley: Amer. Inst. Mining and Metallurgical Engineers, Trans. [preprint] 994, p. 3, 1920; Trans. 65, p. 151-155, 1921. Paleozoic stratigraphy is briefly reviewed, and the structures are explained. Most of the reference is about production and economics.

JOHNSON, S. W.

1. (and Blake, John M.). On kaolinite and pholerite [Carbon County]: Amer. Jour. Sci. 2nd ser. 43, p. 351-361, 1867. Kaolinite is completely described and discussed as a group name. The discussion is about kaolin minerals in general, with one example from the Commonwealth.

JOHNSON, WALTER ROGERS, 1794-1852.

1. Analysis of some of the anthracites and iron ores found on the headwaters of Beaver Creek, in the counties of Luzerne, Northampton, and Schuylkill, Pa.: Franklin Inst., Jour. ns 24, p. 289-298, illus., 1839.
2. Analysis of some of the minerals found at Karthaus and Three Runs, on the west branch of the Susquehanna River, Clearfield County, Pennsylvania: Franklin Inst., Jour. ns 23, p. 73-80, 1839. Coal, iron ore, and limestone are described and analyzed.
3. Examination of some of the anthracites found in Sugar Loaf Township, Luzerne Co., Pa.: Franklin Inst., Jour. ns 24, p. 73-77, 1839. Analyses of three different

specimens are given. The ash content varies, but all of them are good coals for boiler use.

4. Report of a geological, mineralogical, and topographical examination of the coal field of Carbon Creek [Bradford County] . . .: 47 p., illus., Philadelphia, 1840; extract, Amer. Jour. Sci. 39, p. 137-149, 1840. A syncline, several miles in breadth, contains bituminous coal which is described and analyzed. Two main beds are present; one is up to seven feet thick, the other up to three. Iron carbonate as an ore is also described, as is limestone.
5. [Analyses of Pennsylvania coals]: Acad. Nat. Sci. Phila., Proc. 1, p. 155-156, 1841. Analyses showing volatile matter, ash, and carbon of five Pennsylvania and some foreign coals are given.
6. [Crystalloid coal, Dauphin County]: Acad. Nat. Sci. Phila., Proc. 1, p. 73-75, 1841. Ovoid, radiated, rhombic hexahedra, and octahedral blocks are reported from coal beds. Explanations are offered for the phenomena. They are related to the amount of earthy residuum.
7. On the relation between the coal of South Wales and that of some [Dauphin County] Pennsylvania anthracites: Acad. Nat. Sci. Phila., Proc. 1, p. 40-42, 1841; Jour. 8, p. 195-199, 1842. A foreign coal is compared with some from the Commonwealth which have similar physical properties.
8. Remarks on the Bear Valley coal district in Dauphin County, Pa.: Franklin Inst., Jour. 3rd ser. 2, p. 318-327, illus., 1841; also *as* Report of an examination of the Bear Valley coal district in Dauphin County, Pennsylvania. 10 p., illus., J. and W. Kite, Philadelphia, 1841. A general description of the coals and their structure is given. Iron ore is also described from the area. Emphasis is on the mining problems.
9. Report of a survey and exploration of the coal and ore lands belonging to the Allegheny Coal Company in Somerset County, Pennsylvania: 64 p., illus., J. and W. Kite, Philadelphia, 1841. This is a prospectus describing the coal basin just east of Savage Mountain. The Pennsylvanian rocks are described, as is the structure of the basin. Coal, iron, limestone, and fire clay are considered. Some analyses are given.
10. Some observations on the mechanical structure of coal, with evidences of the contemporaneous origin of its various kinds: Acad. Nat. Sci. Phila., Proc. 1, p. 9-12, 1841; Jour. 8, p. 173-178, 1842. Similarity of stratigraphic sequence and fossil similarities suggest the contemporaneous deposition of the anthracite and bituminous coals; iron-carbonate bodies in both suggest the same thing. The mechanical structures of both kinds suggest this also. Parallel partings at the top and bottom of beds, the relation to the under- and overlying slate, jointing, and vertical partings, or "cleats," are common to both. Natural coke in both is also considered as evidence of contemporaneity.
11. A section of the coal seams and accompanying measures of the Hazleton coal basin in Luzerne County, Penn. [abs.]: Amer. Jour. Sci. 2nd ser. 5, p. 111-113, 1848.
12. Charter of the Somerset Iron and Coal Company of Pennsylvania with a description of the iron and coal mines and other minerals and improvements upon the Company's lands together with the report of a survey and exploration of the lands now belonging to the Company [Somerset County]: 40 p., illus., H. E. Huber, Baltimore, 1860. A syncline has preserved Allegheny Formation coal beds. They are described and analyzed without names. Sedimentary iron ore deposits in the Pottsville and Mauch Chunk are described and analyzed. Limestone [Pennsylvanian] is described and analyzed.

JOHNSON, WAYNE S.

1. The petrology of the Morgantown sandstone of the Pittsburgh [Allegheny County] district: M.S. thesis, Univ. Pittsburgh, 1942.

JOLY, HENRI

1. Notice sur le Dr. Professor Charles Othniel [!Othniel Charles] Marsh (29 octobre 1831-18 mars 1899): Soc. d'Etudes scientifique d'Angers, Bull. ns 30, 114-117, 1901.

JONAS, ANNA ISABEL. See also Stose, Anna Isabel Jonas; Bascom, Florence, 17; Bliss, Eleanora Frances, 2; Knopf, Eleanora Frances Bliss, 2, 4; Miller Benjamin LeRoy, 22; Stose, George Willis, 18, 19, 20, 22, 23, 24, 32, 33, 36, 39.

1. Serpentine in the neighborhood of Philadelphia: Amer. Geologist 36, p. 296-304, 1905. Serpentine areas of the eastern United States are listed. Those in the Philadelphia area occur as dikes in mica gneiss and Baltimore gneiss. The strike is southwest-northeast. They are altered peridotites, pyroxenites, and dunites.
2. (and Knopf, Eleanora Bliss). Relation of the Wissahickon mica gneiss to the Shenandoah limestone and to the Octoraro mica schist, of the Doe Run-Avondale district, Coatesville quadrangle [Chester County], Pennsylvania: Ph.D. thesis, Bryn Mawr College, 1914.
3. Pre-Cambrian and Triassic diabase in eastern Pennsylvania: Amer. Museum Nat. Hist., Bull. 37, p. 173-181, illus., 1917. The Precambrian metamorphic rocks of the Reading Prong are described, as are the various types of Triassic sedimentary rocks. The diabase dikes which are present are discussed in detail and shown to be quite different and easily distinguished from those in the Precambrian.
4. (and Knopf, Eleanora Bliss). Stratigraphy of the metamorphic rocks of southeastern Pennsylvania and Maryland [abs.]: Wash. Acad. Sci., Jour. 11, p. 446-447, 1921.
5. Rocks of the McCalls Ferry quadrangle [Lancaster-York Counties], Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 62, 7 p. (#), illus., 1923. A brief description of the quadrangle is given. Precambrian-Ordovician, Triassic rocks are described. The structure is outlined; overthrusts and folds are common. Limestone, silver, and limonite are the chief resources.
6. Rocks of the Quarryville quadrangle [Lancaster-Chester Counties], Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 75, 9 p. (#), illus. incl. geol. map, 1923. A brief description of the area is given. Precambrian-Ordovician rocks are present. Structure is considered. Limestone, sand, slate, chromium, iron, and nickel are the chief mineral resources.
7. (and Stose, George Willis). Geology and mineral resources of the New Holland quadrangle [Lancaster-Berks Counties], Pennsylvania: Pa. Geol. Survey 4th ser., Topog. Geol. Atlas 178, 40 p., illus. incl. geol. map, 1926. A complete geologic description of the area is given. Precambrian-Triassic rocks are mapped. Folds and faults characterize the structure. Limestone, clay, shale, and sand are the chief mineral resources.
8. (and Knopf, Eleanora Bliss). Summary of the pre-Cambrian geology of Pennsylvania and Maryland [abs.]: Geol. Soc. Amer., Bull. 38, p. 111-112, 1927.
9. Structure of the metamorphic belt of the central Appalachians: Geol. Soc. Amer., Bull. 40, p. 503-513, 1929. The Piedmont-Blue Ridge structure in the Commonwealth is included. The Precambrian-Paleozoic rocks are strongly folded and the Precambrians are thrust-faulted over the Paleozoics from the southeast. This is the Martic overthrust. Other smaller thrusts are also common in the Paleozoic limestones. Granites have intruded the complex in other areas but not the Commonwealth.
10. (and Stose, George Willis). Geology and mineral resources of the Lancaster quadrangle [Lancaster-Lebanon Counties], Pa.: Pa. Geol. Survey 4th ser., Topog. Geol. Atlas 168, 106 p., illus. incl. geol. map, 1930. A complete geologic description of the area is given. Cambrian-Ordovician, Triassic, and Pliocene(?)-Pleistocene rocks are mapped. The structure is extremely complex. Limestone is the chief mineral resource. Sand, clay, stone, iron ore, and lead and zinc are also present.
11. (and Knopf, Eleanora Frances Bliss). Washington to Baltimore, Md., and York [York County], Pa., *in* Southern Pennsylvania and Maryland: Internatl. Geol. Cong., 16th, U. S. 1933, Guidebook 10, Excursion B-3, p. 27-31, illus. incl. geol. map, 1932. This is a guidebook and itinerary of a trip including York County. Precambrian-Tertiary rocks are described; strip maps are included.
12. (and Stose, George Willis). Appalachian structure in [York County] southeastern Pennsylvania [abs.]: Geol. Soc. Amer., Proc. 1934, p. 87, 1935.
13. Pre-Triassic volcanic rocks of the southern Appalachians [abs.]: Amer. Geophysical Union, Trans. [16] Part 1, p. 284 (#), 1935.

14. (and Stose, George Willis). Age reclassification of the Frederick Valley (Maryland) limestones: Geol. Soc. Amer., Bull. 47, p. 1657-1674, illus., 1936; discussion by B. L. Miller, Suppl., p. 2017-2018; reply by authors, p. 2018. The Conestoga limestone in southeastern Pennsylvania is compared to the Cambro-Ordovician limestones in Maryland. In Chester Valley, from fossils, the Conestoga is considered a Beekmantown limestone equivalent, but no fossil age-evidence exists for the rest of the exposures, known to be overlapping.

15. Tectonic studies in the crystalline schists of southeastern Pennsylvania [Lancaster-York Counties] and Maryland: Amer. Jour. Sci. 5th ser. 34, p. 364-388, illus., 1937. Small-scale recumbent folds in the Wissahickon schist over the Tucquan arch are described. The fold axes dip gently southwestward. The dominant foliation is parallel to the limbs of the folds. The beds are in S-shaped contortions. This suggests that the major folding is recumbent also, even though the limbs of the Tucquan arch seem gentle.

JONES, HOWARD GRANT

1. Notes on the Cumberland or Potomac coal basin [Somerset County]: Amer. Phil. Soc., Proc. 19, p. 111-116, 1881; discussion with title, [Remarks on the duplication of the Mountain limestone and the Mauch Chunk red shale formations] by J. P. Lesley, p. 110, 1881. The northern portion of this basin is in the Commonwealth. The Pennsylvanian rocks and associated coals are described.

JONES, N. F. See Ashburner, Charles Albert, 14.

JONES, VERNER EVERETT. See also Robinson, J. French, 6.

JONES, T. H.

1. A geologist abroad in Wyoming Valley—a brief outline of the geological history of the territory about Wyoming Valley . . . [Wyoming County]: Wyoming Hist. Geol. Soc., Quarterly Bull. 1, no. 1, p. 3-10 (#), 1934. A generalized review of the geology of the county is given. No new details are included.

JONES, THOMAS RUPERT, 1819-1911.

1. Notes on some Paleozoic bivalved Entomostraca—no. 4, Some North American species: Annals and Mag. of Nat Hist. 3rd ser. 1, p. 241-257, illus., London, 1858. *Leperditia pennsylvanica* from the Silurian near Barre Forge [Huntingdon County], *L. ovata* from the Ordovician at Potter's Fort, Penn's Valley [Centre County], *Beyrichia maccoyiana* from the [Devonian] somewhere in the Commonwealth, and *B. pennsylvanicans* from Barre Forge are described and illustrated.

2. Notes on the Beyrichiae and Leperditiae of Pennsylvania, *in* Geology of Pennsylvania 2, by H. D. Rogers: 834 p., illus., Philadelphia, 1858. *Beyrichia pennsylvanica* and *B. maccoyiana* are described from Scalent (Silurian) rocks. *Leperditia ovata*, *L. pennsylvanica*, and *L. gibbera* are from Auroral and Scalent (Ordovician and Silurian) rocks. No localities are given.

3. On some Paleozoic Ostracoda from [Perry County] Pennsylvania, U. S.: Amer. Geologist 4, p. 337-342, illus., 1889. Four genera and five species from Upper and Lower Devonian rocks, and three genera and three species from Silurian [Lower Helderberg] rocks are described and illustrated.

JONGMANS, WILLIAM JOSEPHUS

1. (and Gothan, Walter Ulrich Eduard Friedrich). Florenfolge und vergleichende Stratigraphie des Karbons der östlichen Statten Nord-Amerika's Vergleich mit West-Europa: Geol. Bur. Nederlandsche Mijngebied Heerlen, Jaarverslag 1933, p. 17-44, 1934. Plants are listed from the various units in the [Pennsylvanian] and [Mississippian] Systems of the Commonwealth, and correlations are made with nearby states and Europe.

2. (and Waterschoot van der Gracht, Willem A. M. J. van). Carboniferous floras of the United States and of western Europe [abs.]: Geol. Soc. Amer., Proc. 1934, p. 366, 1935.

3. Floral correlations and geobotanic provinces within the Carboniferous: Internatl. Geol. Cong., 16th, U. S. 1933, Rpt. 1, p. 519-527, illus., 1936. European and North American floral zones are discussed and correlations are made. The Commonwealth is included.

4. (and Gothan, Walter Ulrich Eduard Friedrich, and Darrah, William Culp). Beiträge zur Kenntniss der Flora der Pocono-Schichten aus Pennsylvanien und Virginia: Cong. strat. carbonifière, 2nd, Heerlen 1935, C. R. 1, p. 423-444, illus., Maastricht, 1937. Plants from Pottsville Gap, Pine Grove (Schuylkill County), and Virginia are described and illustrated.
5. Contributions to a comparison between the Carboniferous floras of the United States and of western Europe: Cong. strat. carbonifière, 2nd, Heerlen 1935. C. R. 1, p. 362-386, illus., Maastricht, 1937; note by W. C. Darrah, p. 386; reply by author, p. 387; additional note . . . by W. A. J. M. van Waterschoot Van der Gracht, p. 388-392. A discussion of the time-stratigraphic units in the United States, including the Commonwealth, in comparison with Europe, is followed by a list of plants from Pottsville and younger rocks from [Schuylkill County] and from the Pocono Formation in the same area. Tentative European correlations are made. [Permian may not be present, from studies in West Virginia]. The Appalachian orogeny may have come earlier than now considered.
6. Some remarks on *Neuropteris ovata* in the American Carboniferous: Cong. strat. carbonifière, 2nd, Heerlen 1935, C. R. 1, p. 417-422, illus., Maastricht, 1937. Some are illustrated and described from various places in the Commonwealth.

JOYCE, W. E.

1. New supplies of anthracite coal [Luzerne County]: Engineering and Mining Jour. 84, p. 216-217, 1907. The presence of several seams of anthracite below red shale and outside of the known boundary of the fields is noted.

KAY, GEORGE MARSHALL. See also Krynine, Paul Dimitri, 10.

1. Distribution of Ordovician altered volcanic materials and related clays: Geol. Soc. Amer., Bull. 46, p. 225-244, illus., 1935. Middle Ordovician limestones are correlated over long distances on the basis of altered ash which is present. Graphic sections and fossil lists are given. Almost all of the eastern United States is included.
2. Taconic allochthone and the Martic thrust: Science ns 94, p. 73, 1941. Outliers of shale near Harrisburg and elsewhere in the Great Valley are considered klippen of the Martic overthrust. Fossils show the Ordovician age of the Peach Bottom slate which unconformably overlies the Precambrian Wissahickon schist.
3. Development of the northern Allegheny synclinorium and adjoining regions: Geol. Soc. Amer., Bull. 53, p. 1601-1657, illus., 1942. A detailed history of the synclinorium is given. Isopach maps are used, as are structural features to show: (1) Gross deformation was downward in the early and middle Paleozoic; (2) clastic rocks have greatest thickness; (3) folds parallel the structural front, and (4) the front has an arcuate trend of deltageosynclinal isopachs.
4. Chemical lime in [Centre-Clinton Counties] central Pennsylvania: Economic Geology 38, p. 188-203, illus., 1943. The Valentine member of the Curtin limestone Formation of Middle Ordovician age is the biggest source of pure limestone in the area. It is described in detail; sections are measured. It is up to 90 feet thick, and is absent in some areas due to post-Valentine erosion.
5. Middle Ordovician of central Pennsylvania—Part 1, Chazyan and earlier Mohawkian (Black River) formations—Part 2, Later Mohawkian (Trenton) formations: Jour. Geology 52, p. 1-23, 97-116, illus., 1944. The Chazyan and Mohawkian Series consist of 1,500 feet of limestone and shale. The various formations are described and discussed. Fossils are listed.
6. Summary of Middle Ordovician bordering Allegheny synclinorium, *in* Appalachian Basin Ordovician synposium, ed. by J. T. Galey: Amer. Assoc. Petroleum Geologists, Bull. 32, p. 1387-1416, illus., 1948. Ordovician limestone units are described. Isopach and paleolithologic maps are given of each unit.

KEATING, WILLIAM HYPOLITUS

1. Narrative of an expedition to the source of St. Peter's River . . . in 1823 . . . by Stephen H. Long . . .: 2 vols., 439 p., 459 p., illus., Philadelphia, 1824; [2nd ed.?], 458 p., 248 p., 156 p., 1825. The expedition left from Philadelphia and the geology of the Commonwealth was mentioned briefly.

KEELEY, FRANK J.

1. The Black Moshannon Park [Centre County] aerolite: Acad. Nat. Sci. Phila., Notulae Naturae 99, 4 p., illus., 1942. A complete physical and mineralogical description of the chondritic meteorite is given, along with a description of its fall.

KEITH, ARTHUR. See also Barrell, Joseph, 4.

1. Geology of the Catoctin belt [Adams-Franklin Counties]: U.S. Geol. Survey, Ann. Rpt. 14, Part 2, p. 285-395, illus. incl. geol. map, 1894. The report deals with Virginia, West Virginia, Maryland, and a small part of southern Adams and Franklin Counties. Precambrian-Tertiary rocks are described, as is the structure. The extensive Tertiary erosion levels are described also.
2. The Appalachian mountains and valleys [abs.]: Science ns 25, p. 865-867, 1907. An expanded abstract. A generalized description of the physiography of the Commonwealth is given. The influence of lithology is mentioned, as is the action of streams.
3. Outlines of Appalachian structure: Geol. Soc. Amer., Bull. 34, p. 309-380, illus., 1923. A complete description of the structural features of the Appalachians, from New England to Alabama, is given. Various effects of the energy and of the Precambrian basement are included. Theories of the forces are discussed. Examples from the Commonwealth are included.
4. Recently determined overthrusts in the Appalachians [abs.]: Geol. Soc. Amer., Bull. 39, p. 178, 1928; Pan-Amer. Geologist 49, p. 139-140, 1928.
5. Structural symmetry in North America: Geol. Soc. Amer., Bull. 39, p. 321-385, illus., 1928. Evidence is described, including much from the Commonwealth, which demonstrates that the Appalachian Mountains were formed by thrusting toward the continent. The central area served as a massif and created a symmetry of structure all along the Appalachians. Evidence for geanticlines and geosynclines is shown.

KELLER, FRED, JR. See also Joesting, Henry Rochembeau, 1.

1. (and Landsberg, Helmut Erich). Geo-electric investigations over Penn's Cave [Centre County]: Pa. Acad. Sci., Proc. 15, 65-68, illus., 1941. Direct-current resistivity surveys over the known cave result in curves which resemble curves made over a known water table.

KELLER, H. A.

1. Titaniferous garnet [Delaware County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 54-55, 1883; Mineralogy and Geol. Sec., Proc. no. 2, p. 21-22, 1882. Black garnets from Darby contain titanium. They occur in a horizontal mica schist bed associated with quartz and hydromica schist.

KELLY, WILLIAM. See Rutledge, John Joseph, 1.

KEMP, JAMES FURMAN, 1859-1926.

1. Bibliography of Professor J[ohn] S[trong] Newberry [1822-1892]: New York Acad. Sci., Trans. 12, p. 173-186, 1893.
2. In memoriam—Professor John Strong Newberry [1822-1892]: Columbia Univ., School of Mines Quarterly 14, p. 93-111, 251-252, ports., 1893.
3. Memorial of John Strong Newberry [1822-1892]: Geol. Soc. Amer., Bull. 4, p. 393-406, 1893.
4. Notes on the lower Coal Measures of western Clearfield County, Pennsylvania: Columbia Univ., School of Mines Quarterly 14, p. 349-353, 1893. Generalized sections of [Pennsylvanian] rocks are given, along with descriptions and analyses of some of the coals.
5. On an occurrence of gabbro (norite), near Van Artsdalen's quarry, Bucks County, Pennsylvania: New York Acad. Sci., Trans. 12, p. 71-77, illus., 1893. A hypersthene-bearing gabbro is described petrographically and lithologically. It is related to, and possibly is the origin of, the metamorphic minerals in the limestone quarry.
6. The nickel mine at Lancaster Gap, [Lancaster County] Pa., and the pyrrhotite deposits at Anthony's Nose, on the Hudson: Amer. Inst. Mining Engineers, Trans. 24, p. 620-633, 888, illus., 1895. The Gap mines are described in detail. The ore is from a magmatic differentiate of basic igneous rocks. The ore is nickeliferous pyrrhotite.

7. (and Ross, J. G.) A peridotite dike in the Coal Measures of [Fayette County] southwestern Pennsylvania: New York Acad. Sci., Annals 17, p. 509-518, illus., 1907. The dike is described in considerable detail and is related to other basic intrusions of a similar nature in the United States. It is from 1-3 feet across. It is thicker underground.
8. Buried river channels of the northeastern states: Wyoming Hist. Geol. Soc., Proc. 14, p. 35-54, illus., 1915. The Wyoming buried valley is described along with many others. Little detail is included.
9. New features in structural geology of the anthracite basins: Amer. Inst. Mining and Metallurgical Engineers, Trans. [preprint] 1112, 15 p., illus., 1922; Trans. 66, p. 303-317, illus., 1922. Cross sections show the violent distortion of the beds. Many of the folds in the synclinoria are overturned. Faulting, mostly thrusting, which had not been detected previously is also illustrated.
10. Memorial of Edmund Otis Hovey [1862-1924]: Geol. Soc. Amer., Bull. 36, p. 85-100, port., 1925.

KERNS, W. H.

1. (and Sanford, Robert S.). Investigation of Simon and Coles manganese deposit, Bedford County, Pa.: U. S. Bur. Mines, Rpt. Inv. 4312, 6 p. (#), illus., 1948. Psilomelane and manganiferous iron ore occur in the Mauch Chunk Formation. Drill holes are logged.
2. (and Sanford, John S.). Investigation of the Critchfield manganese deposit, Huntingdon County, Pa.: U. S. Bur. Mines, Rpt. Inv. 4326, 7 p. (#), illus., 1948. Manganese nodules occur in residual clay of the Cambrian Gatesburg Formation. Drill holes are logged.

KERR, PAUL FRANCIS

1. Zinc deposits near Franklin, New Jersey, *in* Mineral deposits of New Jersey and eastern Pennsylvania, by Berkey, C. P.: Internatl. Geol. Cong., 16th, U. S. 1933, Guidebook 8, Excursion A-8, p. 2-13, illus. incl. geol. map, 1932. This contains a geologic map of eastern Pennsylvania and northern New Jersey. Precambrian-Tertiary rocks are exposed.

KESSLER, D. W.

1. (and Sligh, W. H.). Physical properties and weathering characteristics of slate: U. S. Bur. Standards, Jour. Research 9, p. 377-411, illus., 1932; reprinted *as* U. S. Bur. Standards, Research Paper 447. Slates from the Commonwealth are included among others. Most are from the slate belt in the Martinsburg Formation.

KEYES, CHARLES ROLLIN

1. An Iowa scientist [Frank Leverett, 1859-] and his work: Annals of Iowa 3rd ser. 4, p. 383-392, port., 1900.
2. A schematic standard for the American Carboniferous: Amer. Geologist 28, p. 299-305, illus., 1901. The relations between the Carboniferous of the mid-continent, the Illinois basin, and the Appalachian area are discussed. Physical correlation of units is impossible. The Pottsville is equated to the Arkansan [Lower Pennsylvanian]; the Allegheny is equivalent to the Des Moines; the Conemaugh, Monongahela, and Dunkard are littoral facies of the Missourian. No Permian [equivalent of mid-continent] is present.
3. An origin of crystalline schists [abs.]: Geol. Soc. Amer., Bull. 32, p. 34, 1921.
4. Exploratory coal stratigraphy of John James Stevenson [1842-1924]: Pan-Amer. Geologist 42, p. 161-172, port., 1924.
5. [Henry] [Darwin] Rogers [1808-1866] of the folded mountains: Pan-Amer. Geologist 45, p. 1-14, port., 1926.
6. Charles Doolittle Walcott [1851-1927]: Pan-Amer. Geologist 47, p. 161-170, port., 1927.
7. James Furman Kemp [1859-1926], economic geologist: Pan-Amer. Geologist 47, p. 81-92, port., 1927.
8. Israel C[harles] White [1848-1927], petroleumist: Pan-Amer. Geologist 49, p. 1-16, port., 1928.

KIMBALL, JAMES PUTNAM

1. Flora from the Appalachian coal field: Thesis, Göttingen Univ., 38 p., illus., Göttingen, 1857; summary with title, Über einige fossile Pflanzen aus der Kohlen-Formation von [western] Pennsylvanien und Ohio: Neues Jahrb.

1858, p. 400-402, Stuttgart, 1858. Plants of the [Pennsylvanian] from western Pennsylvania are described and illustrated. Many are new. The locations are not given for many.

2. The Quemahoning coal-field of Somerset County, Pennsylvania: Amer. Inst. Mining Engineers, Trans. 12, p. 468-496, illus., 1884. A very detailed description of the structure, coal, and coal-bearing rocks is given. Sections are measured, and analyses are made.
3. Genesis of iron ores by isomorphous and pseudomorphous replacement of limestone, etc.—[Part 1]: Amer. Jour. Sci. 3rd ser. 42, p. 231-241, 1891;—[Part 2]: Amer. Geologist 8, p. 352-376, 1891. The problem is discussed in general, with certain examples being taken from the Commonwealth. The Clinton ores are sometimes replaced by red and brown oxides from extraneous sources. Carboniferous limestone is sideritic in part; limonite is also present. The replacement ore of the Cambro-Ordovician rocks is also described. The Triassic magnetite ore is described as a replacement.

KINDLE, EDWARD MARTIN. See also Williams, Henry Shaler, 9.

1. Faunas of the Devonian section near Altoona [Blair County], Pa.: Jour. Geology 14, p. 631-635, 1906. The important fossils of the section from Oriskany to Catskill are listed, by formation.
2. The southerly extension of the Onondaga sea in the Allegheny region: Jour. Geology 19, p. 346-357, 1911. The finding of Onondaga fauna shows that the Onondaga sea extended much farther south than New York. It probably originally covered the whole Commonwealth. The lithology is described and the fossils are listed.
3. The Onondaga fauna of the Allegheny region: U. S. Geol. Survey, Bull. 508, 144 p., illus., 1912. The Commonwealth is included in a regional discussion. Sections are measured; fossils are listed and figured. Correlations are made with neighboring states.

KING, ALFRED T.

1. Description of fossil foot marks, supposed to be referable to the classes Birds, Reptilia, and Mammalia, found in the Carboniferous series in Westmoreland Co., Pa.: Acad. Nat. Sci. Phila., Proc. 2, p. 175-180, illus., 1844; Amer. Jour. Sci. 48, p. 343-352, illus., 1845. Illustrations and analyses are made of footprints. There are seven varieties. Two are from birds?; one reptile, and possibly three kinds of mammal tracks are included. The presence of air-breathing animals casts suspicion on the theory that the Carboniferous plants were large due to excess CO_2 in the air.
2. Description of fossil footprints [Westmoreland County]: Acad. Nat. Sci. Phila., Proc. 2, p. 299-300, 1845; Amer. Jour. Sci. 2nd ser. 1, p. 268, illus., 1846. Prints of a large, cloven-hoofed ruminant are described from a sandstone bed on Chestnut Hill. Others are mentioned but not described in detail.
3. Footprints [Westmoreland County] [abs.]: Amer. Jour. Sci. 49, p. 216-217, illus., 1845; discussion with title, On the evidence of fossil footprints of a fossil allied to the *Cheirotherium* in coal strata of [Westmoreland County] Pennsylvania by C. Lyell: Amer. Jour. Sci. 2nd ser. 2, p. 25-29, 1846.
4. Description of fossil fruit found in the Carboniferous rocks of Beaver County, Pa.: Acad. Nat. Sci. Phila., Proc. 7, p. 66, 1854. *Trigonocarpum carbonarium*, a large nut, is described from sandstone near New Brighton.
5. Description of fossil trees in the coal rocks near Greensburgh, Westmoreland County, Pennsylvania: Acad. Nat. Sci. Phila., Proc. 7, p. 64-65, 1854. Large, silicified logs are described from the surface; their classification is uncertain. Very large coaly-siliceous trees are also described from the bedrock.
6. On the ancient alluvium of the Ohio River and its tributaries: Acad. Nat. Sci. Phila., Proc. 7, p. 4-8, 1854. Raised terraces along the Beaver River are described in detail. They are attributed to uplift of the area. [Pleistocene] fossils are mentioned from them. Glaciation is not considered.

KING, ELIZABETH. See Joesting, Henry Rochembeau, 1.

KING, HELEN DEAN

1. Edward Drinker Cope [1840-1897]: Amer. Geologist 23, p. 1-41, port., 1899.

KING, PHILIP B. See Moore, Raymond Cecil, 2.

KINGSLEY, JOHN STERLING

1. (and others). Edward Drinker Cope [1840-1897]: Amer. Naturalist 31, p. 410-419, ports., 1897.

KLEIN, C.

1. Optische Studien an Granat, Vesuvian und Pennin [Chester County]: Konigl. preuss. Akad. Wiss. Berlin, Sitzungsb. 1894, p. 723-772, illus., 1894. In a monographic study, a sample of clinochlore from West Chester is used as an example of certain optical properties.

KLEIN, NORMAN H. See Adamson, John Howard, Jr., 3.

KLEPPER, M. R. See Krynine, Paul Dimitri, 1.

KLINGSBURG, CYRUS

1. A partial study of certain gravels near Philadelphia [Philadelphia-Bucks Counties]: M.A. thesis, Bryn Mawr College, [no date].

KNAPP, G. N. See Bascom, Florence, 9.

KNAPPEN, RUSSELL STAFFORD

1. James Furman Kemp [1859-1926]: Amer. Assoc. Petroleum Geologists, Bull. 11, p. 221-222, 1927.

KNEELAND, H. C., JR. See Leggette, Ralph Maxwell, 2.

KNERR, E. B.

1. (and Schoenfeld, J.). Glauconite, apophyllite, and heulandite, [Part] 3 *of* Mineralogical notes: Amer. Chemical Jour. 6, p. 412-413, 1885. Glauconite and apophyllite from French Creek, Chester County, and heulandite from Adamstown, Lancaster County, are described.
2. (and Brunner, D. B.). Menaccanite, [Part] 5 *of* Mineralogical notes [Lancaster County]: Amer. Chemical Jour. 6, p. 413, 1885. The mineral occurs in quartz near Adamstown.

KNOP, A.

1. Beiträge zur Kenntniss einiger Gleider der Glimmerfamilie [Northampton County]: Zeitschrift fur Krystallographie 12, p. 588-607, Leipzig, 1887. A general discussion of the relations of the phyical and chemical properties of biotites from many places is given. Examples are taken from near Easton.

KNOPF, ELEANORA BLISS. See also Bliss, Eleanora Frances; Jonas, Anna Isabel, 2, 4, 8, 11.

1. Chrome ores of [Lancaster-Chester Counties] southeastern Pennsylvania and Maryland: U. S. Geol. Survey, Bull. 725, p. 85-99, illus., 1921. Chromite occurs massively and as disseminated grains in ultrabasic, differentiated rocks. The igneous rocks were intruded into crystalline schists, and have since been metamorphosed into serpentine.
2. (and Jonas, Anna Isabel). Stratigraphy of the crystalline schists of Pennsylvania and Maryland: Amer. Jour. Sci. 5th ser. 5, p. 40-62, illus., 1923; abstract with discussion by F. Bascom and G. H. Ashley; Geol. Soc. Amer., Bull. 33, p. 110-111, 1922. The Baltimore gneiss is the oldest rock in the region. It is overlain by the Precambrian Glenarm series which are intruded by plutonic rocks. Lava is interbedded near the top. The lower beds of the Glenarm series are strongly metamorphosed, the upper to a lesser degree. Metamorphism is greater in the southeast than the northwest. The Glenarm series was metamorphosed by load, the Baltimore gneiss by igneous intrusion and dynamic forces. Metamorphism and lithologic character are not reliable clues to the stratigraphy.
3. Correlation of residual erosion surfaces in the eastern Appalachian highlands: Geol. Soc. Amer., Bull. 35, p. 633-668, illus., 1924. Drainage changes, superposition, stream cross-profiles, wind gaps, long profiles, interstream elevations, and drainage modifications are used to demonstrate the presence of seven erosion surfaces. The oldest is no older than the late Tertiary.
4. (and Jonas, Anna Isabel). Geology of the McCalls Ferry-Quarryville district [Lancaster, Chester, and York Counties], Pennsylvania: U. S. Geol. Survey, Bull. 799, 156 p., illus. incl. geol. map, 1929; review [discussion] by H. E. McKinstry: Jour. Geology 38, p. 472-473, 1930; reply by authors, 39, p. 166-167, 1931; reply by H. E. McKinstry, p. 761-762. The area is described completely. Precambrian to Ordovician rocks are present. Measured sections and analyses are given. Folds and faults are discussed. Physiography is con-

sidered in detail. Metamorphism is intense. Nickel, iron, chromium, slate, silver, limestone, and sand are the economic products.

5. Memorial of Florence Bascom [1862-1945]: Amer. Mineralogist 31, p. 168-172, port., 1945.

KNOWLTON, F. H.

1. Memoir of W[illiam] J[ohn] McGee [1853-1912]: Geol. Soc. Amer., Bull. 24, p. 18-29, port., 1913.

KOCH, S.

1. Ueber den Wulfenit [Chester County]: Zeitschrift fur Krystallographie 6, p. 389-409, Leipzig, 1882. Wulfenite, a lead tungstate, is reported from the Wheatley mines. It is described crystallographically.

KOEHLER, H.

1. On the anthracite deposit at Tamaqua, Schuylkill County, Pennsylvania: Geol. Soc. Pa., Trans. 1, p. 326-327, illus., 1835. A map and profile of the coal basin between Sharp and Locust Mountains are given. The coals are briefly listed and described. The synclinal nature of the basin is recognized.

KOENIG, GEORGE AUGUSTUS

1. Leidyit, ein neues Silicat der Zeolithgruppe und die vergesellschafteten Mineralien [Delaware County]: Zeitschrift fur Krystallographie 2, p. 300-303, Leipzig, 1878. Leidyite from Delaware County is compared to grossularite, zoisite, and heulandite. Similarity and differences, both physical and chemical, are pointed out.
2. Mineralogical notes [Chester County]: Acad. Nat. Sci. Phila., Proc. [28] 1877, p. 290-291, 1878. Ankerite from Phoenixville is described physically and chemically.
3. On the association of grossularite, zoisite, heulandite, and leidyite, a new species [Delaware County]: Acad. Nat. Sci. Phil., Proc. [30] 1878, p. 81-85, 1878. On Crum Creek, north of Chester, a gneiss quarry has a quartzose seam which contains the unusual minerals. Each is described and analyzed.
4. Mineralogical notes—randite [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [30] 1878, p. 408-409, 1879; discussion by T. D. Rand, Proc. [32] 1880, p. 274-275, 1881. An incrustation of canary- or lemon-colored materials on granite is described and analyzed. It resembles leibigite and volgite but differs slightly chemically. Rand feels an error in analysis has been made and that the material is not valid.
5. Note on zeolites from Delaware Co.: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 288-289, 1883. Quarries near Leiperville have yielded quartz, yellow grossularite, chloritic mica, rose-red zoisite and small crystals of heulandite in one area; stilbite, zoisite, and leidyite are in another; chabazite, siderite, and leidyite are in a third. Thompsonite is in the third mass, and is new.
6. On anhydrite [Delaware County]: Acad. Nat. Sci. Phila., Proc. [41] 1889, p. 11-12, illus., 1889. Anhydrite is reported in the diabase used as railroad ballast at Darby. It is completely described and analyzed. It is secondary from the calcium of labradorite and the sulphur of pyrite in the diabase.
7. Ueber ein bemerkanswerthes Vorkommen von Anhydrit [Delaware County], *in* Neue amerikanische Mineralvorkommen: Zeitschrift fur Krystallographie 17, p. 88-91, Leipzig, 1889. An anhydrite vein is described from a piece of disbase found loose. It is analyzed and described. Its origin is discussed, as it seems to be an alteration of the diabase.

KOHLER, FREDERICK WILLIAM

1. The physiography of the Shenango quadrangle [Crawford-Mercer Counties]: M.S. thesis, Univ. Pittsburgh, 1928.

KOKSCHAROV, N. von

1. Beiträge zur Kenntniss der Krystallization des klinochlors und über das Krystallsystem und die Winkel des Kotschuberts [Lancaster County]: Acad. Sci. St. Petersburg, Mem. 7th ser. 36, no. 10, p. 1-59, illus., 1888. In a monograph dealing with the crystal data of this mineral, three examples come from the Wood Chrome mine at Texas.

KRYNINE, PAUL DIMITRI. See also Robinson, Claire Willard, 1.

1. (and Klepper, M. R., and Glasser, M.). Mineralogy of the Mapleton glass sand [Huntingdon County]: Pa. Acad. Sci., Proc. 13, p. 88-94, illus., 1939;

Pa. State College Mineral Industry Experiment Sta., Tech. Paper 51, 1940. Details of the heavy residue of the Oriskany sand are given. It is compared with residues of the same formation at Mt. Union. Tourmaline-zircon ratios, leucoxene, and garnet are considered. Devonian current directions are postulated.

2. Appalachian orogeny and sedimentation [abs.]: Geol. Soc. Amer., Bull. 51, p. 1999, 1940.
3. Paleozoic heavy minerals from central Pennsylvania and their relation to Appalachian structure: Pa. Acad. Sci., Proc. 14, p. 60-64, 1940; Pa. State College Mineral Industry Experiment Sta., Tech. Paper 63, 1940. Four distinct heavy mineral suites are described. A careful examination shows that the Paleozoic rocks of western and central Pennsylvania are composed of reworked lower Paleozoic rocks and a little from the Precambrian rocks. The Paleozoic orogenies introduced different formations to exposure at different times.
4. Petrology and genesis of the third Bradford sand [Tioga County]: Pa. State College Mineral Industry Experiment Sta., Bull. 29, 134 p., illus., 1940; review [discussion] by P. A. Dickey: Amer. Assoc. Petroleum Geologists, Bull. 25, p. 1413-1415, 1941; reply by author with title, Graywackes and the petrology of Bradford oil field, Pennsylvania, p. 2071-2074, 1941. Mechanical and mineralogical studies of the sandstone formation are given. The source of the sediments and deltaic conditions of deposition are described. Dickey questions some of the broad implications and the terminology.
5. (and Tuttle, Orville Frank). Bellefonte sandstone [Centre County]—example of tectonic sedimentation [abs.]: Geol. Soc. Amer., Bull. 52, p. 1918, 1941.
6. Petrographic studies of variations in cementing material in the Oriskany sand: Pa. State College Mineral Industry Experiment Sta., Bull. 33, p. 108-116, illus., 1941. The pores of the Oriskany sandstone and their textural control are described. Many photomicrographs are used as examples. The cementing material, a function of the composition, also affects the porosity.
7. (and Tuttle, Orville Frank). Petrology of Ordovician-Silurian boundary in central Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 52, p. 1917-1918, 1941.
8. (and Honess, Arthur Pharaoh, and Myers, William Marsh). Siliceous oolites and chemical sedimentation [abs.]: Geol. Soc. Amer., Bull. 52, p. 1916-1917, 1941.
9. Memorial to Arthur P[haraoh] Honess [1886-1942]: Geol. Soc. Amer., Proc. 1942, p. 195-200, port., 1943.
10. (and Kay, George Marshall, and Swartz, Frank McKim). From the Cambrian to the Silurian near State College [Centre County] and Tyrone [Blair County]: Field Conf. of Pa. Geologists, 12th, 32 p. (#), illus., State College, 1946. This is a very detailed and comprehensive guidebook and discussion of the lower Paleozoic rocks in this area.
11. Petrologic aspects of prospecting for deep horizons in Pennsylvania: Producers Monthly 12, no. 3, p. 28-33, 1948; Pa. State College Mineral Industry Experiment Sta., Bull. 48, p. 81-95, illus., 1948. A review of the petrographic properties of reservoir rocks is given. A knowledge of porosity trends in the Commonwealth will enable predictions to be made for future drilling.

KUHN, OLIN R.

1. How much coal is left in Pennsylvania?: Coal Age 27, p. 209-214, illus., 1925. A review of the reserves of the Commonwealth is given. Some of the factors to be considered are discussed. Some of the individual seams are described from the reserve point of view. He quotes Reese (1922) for over 43 billion tons remaining.

KÜMMEL, HENRY BERNHARD. See also Barrell, Joseph, 4; Bascom, Florence, 9, 10.

1. Note on the glaciation of Pocono Knob [Monroe County] and Mounts Ararat and Sugar Loaf, [Wayne County] Pa.: Amer. Jour. Sci. 4th ser. 1, p. 113-114, 1896. Striated boulders near the top of Pocono Knob indicate that it was submerged beneath ice and was not a nunatak. No positive evidence of Ararat's and Sugar Loaf's being covered was found, but because the ice overrode Kittatinny Mt. nearby, these two mountains probably were covered.

KUNZ, GEORGE F.

1. Memoir of Albert E. Foote [1846-1896]: Geol. Soc. Amer., Bull. 7, p. 481-485, 1896.

LACOE, RALPH DUPUY, 1824-1901.

1. [Reptile tracks from the Pennsylvanian of Luzerne County]: Wyoming Hist. Geol. Soc., Pub. 3 [Proc. 3], p. 6-8, 1882. Small tracks are described and are considered to be reptilian. The associated plant fossils are listed. All are from about one mile east of Pittston.
2. List of Paleozoic fossil insects of the United States and Canada: Wyoming Hist. Geol. Soc., Pub. 5 [Proc. 5], 21 p., 1883. The list includes some from the Commonwealth. All are from the [Pennsylvanian] in Luzerne County. No descriptive details are included.
3. Catalogue of the Paleozoic fossil plants of North America: 15 p., Pittston, 1884 [not seen].

LACROIX, ALFRED

1. Sur quelques localities nouvelles de Greenockite [Lehigh County]: Soc. mineralogique de France, Bull. 7, p. 463-466, Paris, 1884. A listing of new localities, with extremely brief physical descriptions of the mineral greenockite, includes the Saucon Valley. It is associated with pyrite and [sphalerite].

LaFORGE, LAURENCE

1. Is there a Permian Series? [abs.]: Wash. Acad. Sci., Jour. 2, p. 106-107, 1912.

LAFFERTY, ROBERT CARROLL, JR.

1. Central basin of Appalachian geosyncline: Amer. Assoc. Petroleum Geologists, Bull. 25, p. 781-825, illus., 1941; Appalachian Geol. Soc., Bull. 1, p. 202-238, illus., 1949. This is a detailed resumé of the existing knowledge of the basin which includes the southwestern part of the Commonwealth. Cambrian-Permian rocks are described, as is the structure. Cross sections are included.

LaFLAMME, JOSEPH CLOVIS KEMNER, 1849-1910.

1. Le docteur Thomas Sterry Hunt [1826-1892]: 16 p., Quebec, 1892; [extract de l'annuaire de l'Université Laval, 1892/93].

LAIRD, WILSON MORROW

1. The stratigraphy and structure of the Martinsburg Formation near Harrisburg [Dauphin County], Pennsylvania: M.A. thesis, Univ. No. Car., 1938.
2. Upper Devonian and Lower Mississippian of southwestern Pennsylvania: Ph.D. thesis, Univ. Cincinnati, 1942; Pa. Topog. Geol. Survey [4th ser.], Prog. Rpt. 126, 23 p., illus., 1941; resumé with title, Devonian and Mississippian inliers of southwestern Pennsylvania: Amer. Assoc. Petroleum Geologists, Bull. 25, p. 161-164, 1941. Laurel Hill and Chestnut Ridge anticlines have brought Devonian rocks to the surface. The sections are described; the fauna is listed. Fossils in the Pocono Formation establish its age as Mississippian. The Devonian is Conewango in age on the basis of facies evidence.

LAKIN, HUBERT WILLIAM. See Robinson, William Orrin, 1.

LAMAR, WILLIAM L. See Leggette, Ralph Maxwell, 1.

LANDIS, D. B.

1. Mineral deposits and works of the Hempfields [Townships] [Lancaster County]: Lancaster Co. Hist. Soc. 8, p. 239-246, 1904. A historical account of the lead, zinc, iron, sand, and ochre development in the Hempfield townships is given. A brief description of the geology is included.

LANDSBERG, HELMUT ERICH. See also Keller, Fred, Jr., 1.

1. Earthquakes and seismology in Pennsylvania: Pa. Dept. Internal Affairs, Monthly Bull. 5, no. 2, p. 3-9, illus., 1938. A generalized discussion of earthquake principles with examples drawn from the Commonwealth is given.
2. The Clover Creek [Blair County] earthquake of July 15, 1938: Seismol. Soc. Amer., Bull. 28, p. 237-241, illus., 1938. The physical results of the earthquake are presented. The earthquake is related to a fault in the area or possibly a cave-in, in the limestones.

LANE, ALFRED CHURCH. See also White, Israel Charles, 27.

1. Nathaniel Southgate Shaler (1841-1906): Amer. Acad. Arts and Sci., Proc. 61, p. 557-561, 1926.
2. Memorial to Arthur Edmund Seaman [1858-1937]: Geol. Soc. Amer., Proc. 1937, p. 191-194, port., 1938.

LANG, VICTOR

1. Versuch einer Monographie des Bleivitriols [Chester-Montgomery Counties]: Kaiserl. Akad. Wiss., Math.—Nat. Klasse, Sitzungsb. 36, p. 241-292, illus., Vienna, 1859. Anglesite from the Wheatley mines in Chester County and the Perkiomen mines in Montgomery County is described crystallographically.

LARSEN, ESPER SIGNIUS

1. A hydrothermal origin of corundum and albitite bodies: Economic Geology 23, p. 398-433, illus., 1928; discussion with title, The origin of corundum aplite, by A. L. duToit, p. 806-809. Evidence is presented to show that the source is hydrothermal rather than magmatic segregation as previously supposed. The exposures in Brinton's quarry, near West Chester, in Chester County, are discussed in detail.
2. Memorial to Arthur Keith [1864-1944]: Geol. Soc. Amer., Proc. 1944, p. 241-245, port., 1945.

LARSON, E. RICHARD

1. Ordovician limestones of the Millheim area, Centre County, Pennsylvania: M.A. thesis, Columbia Univ., 1947.

LASKY, SAMUEL G. See Hickok, William Orville, 4th, 7.

LATHAM, EVERETT B.

1. Geological survey in the vicinity of Lehigh Gap in Pennsylvania: M.A. thesis. Columbia Univ., 1910.

LAW, EDWARD STANLEY

1. A kernkrystall or trapezo-dodecahedron [Delaware County]: Mineral Collector 11, p. 157-158, 1904.
2. Notes on a useful mineral [graphite] [Chester County]: Mineral Collector 12, p. 169-173, 180-184, 1906. A generalized description of the mineral includes a discussion of its occurrence near Phoenixville. It is associated with kaolin veins in the [Pickering] gneiss.
3. On a rare [euxenite] occurrence in Delaware Co., Pa.: Mineral Collector 14, p. 33-35, illus., 1907. A complete description of euxenite is made from specimens found in a quarry near Morton. Crystals are in the pegmatities in the Fairmount granite gneiss. The formula is not given, but it contains more uranium than yttrium.

LAWALL, CHARLES E.

1. (and Protzeller, Raymond J.). Carnotite deposit near Mauch Chunk [Carbon County]: E. M. thesis, Lehigh Univ., 1914.

LAWSON, ANDREW COWPER. See Stose, George Willis, 20.

LEA, ISAAC, 1792-1886.

1. An account of the minerals at present known to exist in the vicinity of Philadelphia: Acad. Nat. Sci. Phila., Jour. 1, p. 462-482, 1818. A list and brief description of the occurrence of 65 minerals are given. The locations are not complete.
2. [Specimens of anthracite coal from Pine Grove, Schuylkill County] [abs.]: Amer. Phil. Soc., Proc. [1841-1843] 2, p. 229-230, 1844.
3. On reptilian footmarks in the gorge of Sharp Mountain near Pottsville [Schuylkill County], Pa.: Amer. Phil. Soc., Proc. 5, p. 91-94, illus., 1849; Amer. Jour. Sci. 2nd ser. 9, p. 124-126, illus., 1850. A reptile footprint is illustrated and described from the [Mauch Chunk] Formation.
4. On traces of a fossil reptile *(Sauropus primaevus)* found in the Old Red Sandstone [Schuylkill County]: British Assoc. Adv. Sci., Rpt. 19, p. sec. 56, London, 1850; discussion with title, On the position and character of the reptilian footprints in the Carboniferous red shale formation of eastern Pennsylvania, by H. D. Rogers: Amer. Assoc. Adv. Sci., Proc. 4, p. 250-251, 1851; in full with title, On the fossil footmarks in the red sandstone of Pottsville, Schuylkill Co., Pa.: Amer. Phil. Soc., Trans. ns 10, p. 307-317, illus., 1853. *Sauropus primaevus* footprints are described and interpreted as reptilian from the [Devonian]. Rogers claims the rocks are [Mauch Chunk] and the tracks are amphibian.
5. [The coal of Dauphin County]: Franklin Inst., Jour. 3rd ser. 21, p. 142-143, 1851. Coals in the southern anthracite field are described with regard to their physical quality for industry. The change in volatile composition from east to west is noted.

6. [A reptilian quadruped from Lehigh County]: Acad. Nat. Sci. Phila., Proc. 5, 1850-51, p. 171-172, 205, 1852. Fragments from the limestone-breccia of the Triassic are mentioned. No details are given, nor is the locality certain. This is the first appearance of Triassic reptile bones from the Commonwealth. The name *Clypsysaurus pennsylvanicus* is proposed.
7. Description of a fossil saurian of the New Red Sandstone formation of [Lehigh County] Pennsylvania—with some account of that formation: Acad. Nat. Sci. Phila., Jour. 2nd ser. 2, p. 185-202, illus., 1853. A generalized description of the Triassic of the Commonwealth is given. The history of its correlation is given. The limestone breccia (Potomac marble) is described and its origin is discussed. Fish and mollusks are the chief fossils. *Clepsysaurus pennsylvanicus* is described in detail.
8. On some new fossil mollusks in the Carboniferous slates of the anthracite seams of the Wilkesbarre coal formation [Luzerne County]: Acad. Nat. Sci. Phila., Jour. 2nd ser. 2, p. 203-206, illus., 1853. Species of *Modiola, Posidonia,* and *Palaeoniscus* are described from black shales overlying coal beds.
9. Description of a new mollusk from the red sandstone near Pottsville [Schuylkill County], Pa.: Acad. Nat. Sci. Phila., Proc. 7 [1854-55], p. 340-341, illus., 1856. *Cypricardia leidyi* is described from the Mauch Chunk shale.
10. [Fossils from the New Red Sandstone formation of Chester County]: Acad. Nat. Sci. Phila., Proc. 8, p. 77-78, 1856; Amer. Jour. Sci. 2nd ser. 22, p. 122-124, 422-423, 1856. The tooth of *Centemedon sulcatus* is reported from the Newark group. *Posidonia* is also found in abundance. Footprints (?) are also noted. Conifer plants are present also, as well as a ganoid fish scale.
11. [Fossils from the red sandstone near Phoenixville, Chester County]: Acad. Nat. Sci. Phila., Proc. [9] 1857, p. 149, 1857. Mention and description is made of a bone of a reptile, possibly *Clepsysaurus pennsylvanicus* or *Centemodon sulcatus.* Teeth from nearby were described previously. A coprolite, in good condition, is probably reptilian and contains fragments of *Posidonia.*
12. [Observations on the geology of the red sandstone near Gwynedd, Montgomery County]: Acad. Nat. Sci. Phila., Proc. [9] 1857, p. 173, 1857. Fish scales from the Triassic are identified as *Radiolepis speciosus.* This find correlates the Triassic of North America with the Commonwealth.
13. [The age of the red sandstones of eastern United States]: Acad. Nat. Sci. Phila., Proc. [10] 1858, p. 90-92, 1858. The [Triassic] sandstone of the Commonwealth is included. It is thought to be [Permian], based on reptiles, plants, fish scales, and some mollusks. It is correlated with the English Bristol beds which, in 1858, were considered [Permian], although some doubts were present.
14. Notes on some members of the feldspar family [Chester-Delaware Counties]: Acad. Nat. Sci. Phila., Proc. [18] 1866, p. 110-113, 1866. Feldspar of many kinds is associated with the serpentine. External characters of many varieties are discussed. Some are new. A microscopic description is also given. Localities are not given.
15. On two new minerals from Chester Co., Pa.: Acad. Nat. Sci. Phila., Proc. [19] 1867, p. 44-45, 1867; analyses by S. P. Sharples: Amer. Jour. Sci. 2nd ser. 47, p. 319-321, 1869. Lesleyite and pattersonite, new, are associated with corundum at Unionville. The latter is micaceous; the former is fibrous. Both are described. Emerylite, corundum, tourmaline, and diaspore are also present.
16. A new locality for allanite [Chester County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 60, 1882. Allanite, associated with zircon in quartz, comes from Yellow Springs. No details are given.

LEA, M. CAREY

1. On the first or southern coal field of Pennsylvania: Amer. Jour. Sci. 40, p. 370-374, 1841. A series of analyses from Lehigh in Carbon County to Rattling Run Gap in Dauphin County shows that bituminization increases westward.

LEASURE, D.

1. [Geological notes], *in* Endemico-epidemic topography of Lawrence County: Medical Soc. Pa., Trans. ns 1, p. 96, 1856. The section near New Castle is described from a cut along the Beaver River. Over 400 feet of [Pennsylvanian] rocks are listed.

LEATHAM, EARL

1. Occurrence and distribution of iron minerals in Pennsylvania fire clays [abs.]: Economic Geology 40, p. 597, 1945; Geol. Soc. Amer., Bull. 56, p. 1176, 1945; Amer. Mineralogist 31, p. 199, 1946.

LeCONTE, JOSEPH, 1823-1901.

1. Memoir of James Dwight Dana [1813-1894]: Geol. Soc. Amer., Bull. 7, p. 461-479, port., 1896.

LEEDS, ALBERT RIPLEY, 1843-1902.

1. The geography and geology of petroleum: Franklin Inst., Jour. 3rd ser. 49, p. 347-356, 1865. The [Devonian] and [Mississippian] oil in the Commonwealth is included in a generalized description of petroleum occurrence.
2. Analysis of some hitherto undetermined American minerals: Franklin Inst., Jour. 3rd ser. 60, p. 62-63, 1870. Scapolite from Bucks County, orthoclase from Delaware County, and breunerite from Montgomery County are analyzed.
3. [Boulders in schist matrix near Philadelphia, Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [22] 1870, p. 134-135, 1870. Hard, compact hornblende-rock boulders are in gneiss in the city. They are a part of the original earth's crust and were deposited as sediments in the now-metamorphosed schist.
4. Hallite, a micaceous (or chloritic) mineral from Chester County [abs.]: Franklin Inst., Jour. 3rd ser. 62, p. 70, 1871.
5. Pennsylvania's ancient sea: Franklin Inst., Jour. 3rd ser. 62, p. 55-61, 133-139, 1871. This is an address describing cursorily the paleogeography of the Commonwealth during the [Paleozoic].
6. Pennsylvania's foundation stones: Franklin Inst., Jour. 3rd ser. 61, p. 337-345, 412-417, 1871. This is an address describing cursorily the [Precambrian] rocks of the Commonwealth and their possible origins.
7. Antholite from the "Star Rock" Concord, Delaware Co., Pa. [Part] 6 *of* Mineralogical notes: Amer. Jour. Sci. 3rd ser. 6, p. 25-26, 1873. A physical and chemical description is given.
8. Mineral associated with corundum and approaching Ripidolite [Chester County], [Part] 4 *of* Mineralogical notes: Amer. Jour. Sci. 3rd ser. 6, p. 24-25, 1873. A mica-like mineral, probably new, is described physically and chemically. It is probably a secondary mineral derived by alteration.
9. Moonstone from Media, Delaware Co., Pa., [Part] 5 *of* Mineralogical notes: Amer. Jour. Sci. 3rd ser. 6, p. 25, 1873. A very brief chemical and physical description of this feldspar is given. Details of location are not given.
10. Wernerite from Van Artsdalen's quarry, Bucks Co., Pa., [Part] 7 *of* Mineralogical notes: Amer. Jour. Sci. 3rd ser. 6, p. 26, 1873. A physical and chemical description is given.
11. A magnesia-iron tremolite, not asbestiform, from the soapstone quarry above Manayunk [Philadelphia County], Pa.: Amer. Jour. Sci. 3rd ser. 9, p. 229-230, 1875. This bronzite(?) is described chemically.

LEEDS, STEPHEN P.

1. The coal lands of the Clinton County Coal Company of Pennsylvania: Mining Mag. 3, p. 513-520, New York, 1854. The [Pennsylvanian] strata and coal beds from near Farrandsville are described.

LEGGETTE, RALPH MAXWELL

1. Ground water in northwestern Pennsylvania, with analyses by M. D. Foster, W. L. Lamar, and S. K. Love: Pa. Geol. Survey 4th ser., W 3, iv, 215 p., illus. incl. geol. maps, 1936. Upper Devonian-Pennsylvanian, and Pleistocene rocks are present. Each is described with special emphasis on the water-bearing properties. Each county is described and the water resources of each is discussed. Glacial material is important. Water analyses are included.
2. Ground water for public supply in western Pennsylvania: Amer. Water Works Assoc., Jour. 32, p. 1857-1864, illus., 1940; discussion by H. C. Kneeland, Jr., p. 1865-1866. A very generalized description of the major geologic units and their water-bearing properties is given. Rocks of Devonian-Permian age are considered.

LEIDY, JOSEPH, 1823-1891.

1. Indications of five species, with two new genera, of extinct fishes: Acad. Nat. Sci. Phila., Proc. 7, 1854-55, p. 414, 1855. Mention and brief description of

Sicarius extinctus are made from somewhere in the Pottsville Formation of western Pennsylvania.

2. Descriptions of some remains of fishes from the Carboniferous and Devonian formations of the United States: Acad. Nat. Sci. Phila., Jour. 2nd ser. 3, p. 159-165, illus., 1856. A tooth of *Petalodus alleghaniensis* from the Pennsylvanian of Blair County is described. *Holoptychius americanus* and *Stenacanthus nitidus*, from the [Devonian] of Tioga County, are described, as is *Apedodus priscus* from the [Devonian] of Columbia County. All are illustrated.
3. Description of two ichthyodorulites [Tioga County]: Amer. Jour. Sci. 2nd ser. 21, p. 421-422, 1856; Acad. Nat. Sci. Phila., Proc. 8, 1856, p. 11-12, 1857. *Stenacanthus nitidus* is described from the Catskill Formation. It is associated with *Holoptychius.*
4. (and Conrad, Timothy Abbott). [Fossils from Phoenixville, Chester County]: Acad. Nat. Sci. Phila., Proc. [9] 1857, p. 149-150, 1858. Pelecypods, of the genus *Posidonia*, are described from the Triassic formations. Also enclosed is a dental bone of a ganoid fish, *Eugnathus* or *Belonostomus.* The beds are correlated with those of North Carolina.
5. [Fossils from Phoenixville, Chester County]: Acad. Nat. Sci. Phila., Proc. [11] 1859, p. 110, 1860. Plants, ostracodes, pelecypods, fish parts, and reptile teeth are listed from Triassic black shales. One reptile, *Eurydorus serridens,* is new and is described.
6. Notice of a corundum mine [Chester County]: Acad. Nat. Sci. Phila., Proc. [24] 1872, p. 238-239, 1872. A body of corundum near Unionville is described. It occurs as a vein lying between gneiss and talcose schist. Its full extent is not known. The blue-gray, crystalline corundum is associated with margarite.
7. Contributions to the extinct vertebrate fauna of the western territories, *in* U. S. Geol. Survey of the Territories, by F. V. Hayden: Rpt. [Mon.] 1, p. 14-358, Washington, D. C., 1873. On page 255, a molar of *Bison latifrons* is described and illustrated from near Pittston in Luzerne County.
8. Remarks on a coal fossil [Dauphin County]: Acad. Nat. Sci. Phila., Proc. [27] 1875, p. 120, illus., 1875. A peculiar impression resembles the tail of a fish, an amphibian, or a plant. It is figured.
9. Remarks on elephant remains [Delaware and Allegheny Counties]: Acad. Nat. Sci. Phila., Proc. [27] 1875, p. 121, 1875. A molar is reported from near Chadd's Ford and another from the gravel of the Allegheny-Monongahela River confluence. They belong to *Elephas americanus.*
10. Bituminous sediments of the Schuylkill River [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [28] 1876, p. 193, 1876. The presence of coal silt in the river is given as an example of a possible origin of bituminous shales.
11. Fish remains of the Mesozoic red shales [Montgomery County]: Acad. Nat. Sci. Phila., Proc. [28] 1876, p. 81, 1876; Amer. Jour. Sci. 3rd ser. 12, p. 223, 1876. Three cycloid scales and a few detached caudal rays are mentioned as coming from the Triassic shale. They resemble *Rabdiolepis elegans.* No descriptions are given.
12. Fossil foot tracks of the anthracite Coal Measures [Schuylkill County]: Acad. Nat. Sci. Phila., Proc. [31] 1879, p. 164-165, illus., 1880. Prints of *Anthracopus ellongowensis* are figured and described. They are in bituminous shale. They make an amphibian trail.
13. Bone caves of Pennsylvania [Monroe County]: Acad. Nat. Sci. Phila., Proc. [32] 1890, p. 346-349, 1881. Hartman's Cave, near Stroudsburg, contains many parts of many vertebrates, some of which are extinct. All are post-glacial. Extinct peccary, *Dicolytes nasutus*, and beaver, *Casteroides ohioensis,* parts are present.
14. Remarks on some rock specimens [Berks County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 10-12, 1882; addition with title *Scolithus* in gravel, p. 93. The ridge near Wernersville, Berks County, is composed of [Precambrian] rocks, mostly gneiss, granite, black syenite, and [diabase]. [Cambrian] quartzite overlies these. This is then overlain by [Cambro-Ordovician] limestones. The sources of these pebbles in the Philadelphia area are described. *Scolithus* fossils in boulders are found in the city of Philadelphia.

15. On an extinct peccary [Mifflin County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 301, 1883. *Platygonus vetus*, new, is reported from clay and gravel in the county. Jaw parts, teeth, and a few bone fragments are all that occur. Dimensions are given.
16. Notice and description of fossils in caves and crevices of the limestone rocks of [Monroe and Berks Counties] Pennsylvania: Pa. Geol. Survey 2nd., Ann. Rpt. 1887, p. 1-20, illus., 1889. Many fossil bones have been found in caves in Pennsylvania. Some are discussed, and new forms are illustrated.

LEIGHTON, HELLEN E.

1. Distribution and character of the Oriskany Formation in the northern Appalachians: M.S. thesis, Univ. Pittsburgh, 1934.

LEIGHTON, HENRY

1. Pyrite in coals of western Pennsylvania [abs.]: Science ns 47, p. 494, 1918.
2. Pyrite from bituminous coal mines in [western] Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 48, 19 p. (#), illus., 1922. Pyrite from coal is considered as a sulphur source. The typical occurrence is as cubes or as "sulphur balls." Marcasite occurs as blades and scales. The distribution is irregular, but locally economic.
3. The geology of Pittsburgh [Allegheny County] and its environs; a popular account of the general geologic features of the region: Carnegie Museum, Annals 17, p. 91-162, illus., 1926. A complete but elementary discussion is given. Pennsylvanian rocks are described, as are the coal, iron, and oil. Fossils are listed also.
4. The fire clays of Pennsylvania: Amer. Ceramic Soc., Jour. 13, no. 2 [Bull. 9, no. 2], p. 22-26, 1930. Fire clays, as underclays of the bituminous coals, are described physically and stratigraphically. They are Pennsylvanian in age.
5. Clay and shale resources of southwestern Pennsylvania: Pa. Geol. Survey 4th ser., M 17, 190 p., illus. incl. geol. map, 1932. The clay resources of the area include: (1) plastic surface clay, or terrace clay of Pleistocene age, and (2) bedded clay, underclay, and shales of the upper Paleozoic. Each county is discussed separately. Analyses and tables of properties are included.
6. [Geology of] Uniontown-Ohiophyle [Fayette County] area: trip 3 *of,* Field Conf. of Pa. Geologists, 4th, 3 p. (#), [Pittsburgh], 1934. This is a mimeographed road log of a trip from Pittsburgh southeastward and back. No details are given.
7. The white clays of Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 112, 19 p. (#), illus., 1934. White residual clays come from weathered feldspathic quartzites, argillaceous and cherty limestones, and from certain schists and phyllites. They are generally true kaolins. The origin of many different deposits is discussed by locality.
8. Guidebook to the geology about Pittsburgh [Allegheny, Westmoreland, and Washington Counties]: Pa. Geol. Survey 4th ser., G 17, 35 p., illus., 1939; reprinted 1947. A generalized description of the geology is given. Pennsylvanian-Permian rocks are exposed. The physiography is important. Sections are measured; fossils are illustrated and listed. Coal, petroleum, and natural gas are the chief resources. Clay, stone, salt, limestone, sand, and gravel are minor products.
9. Clay and shale [Fayette County]: Pa. Geol. Survey 4th ser., C 26, p. 441-455, 1940. Clay is obtained from: (1) unconsolidated terrace clays of the Carmichaels Formation, (2) Devonian-Permian shales, and (3) fire clays in the Pennsylvanian. Each occurrence is described geologically. Analyses are given.
10. Clay and shale resources in Pennsylvania: Pa. Geol. Survey [4th ser.], M-23, vi, 245 p., illus., 1941. A discussion of the various properties and uses of clay and shale is followed by an analysis of the resources by county.
11. A new [Allegheny County] Pennsylvania meteorite: Science 103, p. 694-695, 1946; Popular Astronomy 54, p. 371-372, 1946; Soc. Research Meteorites, Contrib. 3, p. 275-276, 1946 [1947?]. An aerolite is described physically and chemically. It fell in 1886.

LEIGHTON, MORRIS M.

1. Memorial to William Shirley Bayley [1861-1943]: Geol. Soc. Amer., Proc. 1943, p. 105-115, port., 1944.

LEITCH, COLIN M. See Gregory, John Walter, 1.

LEITH, CHARLES KENNETH. See Van Hise, Charles Richard 2.

LEONARD, ARTHUR GRAY

1. The basic rocks of northeastern Maryland, and their relation to granite: Amer. Geologist 28, p. 135-176, illus. incl. geol. map, 1901. While this article is mostly about Maryland, some parts of southern Lancaster County are considered. Rocks in the area are acidic and basic, with all gradations. They are probably differentiates of one magma. Serpentine extends into the Commonwealth. as does gabbro and norite. Granitic rocks intruded the basement gneiss; they grade to diorite; norite is the next intrusive and is the most common. This is followed by proxenite and peridotite. Pegmatites and serpentine are younger, and Triassic diabase is last.

LEONHARD, GUSTAV

1. Topographische Mineralogie der Vereinigten Staaten von Nord-Amerika: Neues Jahrb. Mineralogie, Geognosie, u Geol. 1849, p. 805-836, 1849. A list of minerals and their locations is given. Many are from the Commonwealth, and most are from the southeastern counties. No details are included except associations.

LESHER, CARL E.

1. Coal fields and producing districts, . . . Pennsylvania . . .: Map, scale, 1:1,000,000, U. S. Geol. Survey, [n. d.]; scale, 1:1,500,000, 1917.

LESLEY, J. PETER, 1819-1903. See also Ashburner, Charles Albert, 14; Claypole, Edward Waller, 5; Dewees, John H., 1, 2; Frazer, Persifor, Jr., 16; Hill, Frank A., 5; Jones, Howard Grant, 1; Lesquereux, Leo, 7; Sherwood, Andrew, 1; Trego, Charles B., 2; White, Israel Charles, 4, 6, 8; Willcox, Joseph, 2.

1. Manual of coal and its topography . . .: xii, 224 p., illus., Lippincott, Philadelphia, 1856. This is a textbook about the origin and geological occurrence of coal and its stratigraphy in the Commonwealth primarily, but also elsewhere. Field methods for exploration are included.
2. On the Broadtop coal basin in [Huntingdon-Bedford Counties] central Pennsylvania: Amer. Assoc. Adv. Sci., Proc. 10, Part 2, p. 78-81, illus., 1857. The stratigraphy of the basin is the same as that of western Pennsylvania. A series of gentle folds are present across the basin. A little coal and iron are present in the [Mississippian] rocks.
3. On three comparative sections of the Coal Measures in Kentucky, and in eastern and western Pennsylvania: Amer. Assoc. Adv. Sci., Proc. 11, Part 2, p. 39-42, 1858. The possibility of correlating the anthracite and bituminous beds across the Commonwealth by paleobotanical means is mentioned. Exact examples are not given. The structure in the anthracite fields is revised, and the Mahoning sandstone is shown not to be the equivalent of the Shamokin sandstone.
4. The Iron manufacturer's guide . . .: xxxiv, 766 p., illus., Wiley, New York, 1859; discussion with title, A few facts regarding the geological survey of Pennsylvania, exposing the erroneous claims of J. P. Lesley, by [R. E. Rogers?]: 22 p., Philadelphia, 1859. A complete treatise on iron ore, its occurrence, production and locations, includes much from the Commonwealth.
5. [The structure of a primary limestone bed on the Brandywine above Chadd's Ford, Chester County, in illustration of the tongue structure of folded anticlinals]: Amer. Phil. Soc., Proc. [1861-1862] 8, p. 281-283, illus., 1861. Alternating limestone and quartzite are shown to be a result of extremely tight folds rather than intertongues. They are called fork-tongued anticlinals. The limestone may be within the metamorphic rocks rather than [Ordovician] as generally considered.
6. On the recent discovery of lignite in [Franklin County] Pennsylvania: Amer. Phil. Soc., Proc. 9, p. 463-482, illus., 1865. About 16 feet of lignite was encountered 40 feet below the surface interbedded with sand. Wood logs were recovered. It is compared to the Brandon deposit in Vermont. It is local and not related to the iron ores over which it lies. The ore is residual from dissolved limestone, and is described.
7. [A remarkable coal mine or asphalt vein, cutting the horizontal coal-measures of Western Virginia]: Amer. Phil. Soc., Proc. 9, p. 183-197, illus., 1865

Bitumen in a vein may have come from [petroleum]. It must have come post-Appalachian Revolution. A discussion follows to show that there was post-[Permian] uplift followed by [Triassic] deposition. The present topography is due neither to faults nor glacial action but to folds.

8. [Borings in the petroleum region of Pennsylvania]: Amer. Phil. Soc., Proc. [1865-1868] 10, p. 227-241, illus., 1869. Well records and a few drilling comments from various parts of the oil region are given. The logs describe [Devonian] to [Pennsylvanian] rocks.
9. [Petroleum in the eastern coal fields of Kentucky and records of borings in Pennsylvania]: Amer. Phil. Soc., Proc. [1865-1868] 10, p. 33-68, 187-191, illus., 1869. The [Devonian]-[Mississippian] rocks of the two regions are compared, with emphasis on the Kentucky aspect. Details of the drilling are sparse.
10. Section across the Allegheny Mountains to illustrate the proportionate plication of the earth's surface to its radius: Amer. Phil. Soc., Proc. 11, p. 115, illus., pl. 2, 1871. A cross section to scale, is presented. It is across the central part of the Commonwealth from the Blue Ridge to the Freeport area. It represents 150 miles. The major features are labelled.
11. A record of fourteen oil wells at Brady's Bend, Armstrong Co., Pa.: Amer. Phil. Soc., Proc. 12, p. 562-570, 1873. Fourteen generalized well logs of [Devonian]-[Pennsylvanian] strata of the area are given. The Catskill Formation is a persistent unit.
12. A study of the structure and erosion of Brush Mt., in Blair Co., Pa.: Amer. Phil. Soc., Proc. 13, p. 503-504, illus., 1873. A map is used as a technique for pointing out and emphasizing certain topographic features. Faults which have affected the drainage are postulated.
13. . . . Dunning's Creek fossil iron ore [Bedford County]: Amer. Phil. Soc., Proc. 13, p. 156-168, illus., 1873. [Clinton] ore crops out in the area and is traced and described at different places. There are three ore beds in the red shale; sections are measured.
14. Note on an apparent violation [Somerset County] of the law of regular progressive de-bituminization of the American coal beds coming east: Amer. Phil. Soc., Proc. 12, p. 125-138, illus., 1873. Coal beds near Ursina contain 15-20 percent volatile material, much less than should be expected if the percentage of volatile material increases westward, as it does elsewhere. Exposure to atmosphere is offered as a possible explanation.
15. Recent exposure of a bed of solid brown hematite iron ore in [Huntingdon County] middle Pennsylvania [abs.]: Amer. Phil. Soc., Proc. 12, p. 16, 1873.
16. The iron ores of the South Mountain . . . Cumberland Co., Pa.: Amer. Phil. Soc., Proc. 13, p. 3-21, illus., 1873; reprinted *in* A collection of occasional surveys . . ., by J. P. Lesley: Philadelphia, 1874. Various ore-banks are described. Iron lies in pockets in [Cambro-Ordovician] limestone. The ore is residual from impure limestone, and as such, should be continuous. The ore is [limonite].
17. Topographical map of Pennsylvania, colored for the principal geological formations [no scale given] *in* The coal regions of America . . ., by J. Macfarlane: Appleton, New York, 1873.
18. A collection of occasional surveys of iron, coal, and oil districts in the United States . . .: McCalla and Stavely, Philadelphia, 1874. This is a collection of bound articles which are published in various journals. They deal exclusively with economic geology. These are cited individually.
19. Geological report of 6,436 acres of coal and iron ore lands, at Ursina, Somerset Co., Pa., *in* A collection of occasional surveys . . ., by J. P. Lesley: 12 p., illus., McCalla and Stavely, Philadelphia, 1874. The [Pennsylvanian] stratigraphy is described. The coal beds, of which three are of commercial value, are discussed and correlated.
20. The brown hematite iron ore banks of that part of the Nittany Valley . . . in Huntingdon and Centre Counties, Pennsylvania: 99 p., illus., McCalla and Stavely, Philadelphia, 1874. The Clinton ores and the residual ores in the [Cambro-Ordovician] limestones are described and analyzed. Individual ore bodies are described in detail.

21. Notes on the comparative geology of northeastern Ohio, northwestern Pennsylvania, and western New York: Pa. Geol. Survey 2nd, I, p. 57-108, 1875. The Silurian-[Pennsylvanian] section of the areas is considered. The geographical names of Ohio and New York are recommended rather than the numbered system. Special consideration is given to the Devonian and [Mississippian].
22. (and Lesquereux, Leo). On a map and profile of coal and oil measures along Slippery Rock Creek, in Lawrence Co., Pa.: Pa. Geol. Survey 2nd, J, p. 90-104. illus., 1875. In a series of sections, the Pottsville conglomerate is shown to be absent due to thinning in certain areas. This is used to show how other oil sands can have irregular distributions and thicknesses. The absence of the Pottsville is demonstrated by paleobotany.
23. [Folding and faulting in middle Pennsylvania]: Amer. Phil. Soc., Proc. 14, p. 2-4, 1876. The [Birmingham] overthrust is recognized as a faulted, overturned anticline with the upper plate exhibiting sliding and shearing along the bedding planes.
24. [Former mountain ranges in southeastern Pennsylvania]: Amer. Phil. Soc., Proc. 14, p. 436-437, 1876. Construction of a cross section, and connection of formations show that the original mountains were over 15,000 feet high. The present path of the Schuylkill River is explained as a result of the original structure.
25. [Glacial blocks in West Philadelphia, Philadelphia County]: Amer. Phil. Soc., Proc. 14, p. 644-645, 1876. Large boulders found in the city seem to be in part gneiss from the Reading-Easton area. If this is true, the glacial advance must have come as far south as the mouth of the Schuylkill River.
26. Historical sketch of geological explorations in Pennsylvania and other states—with an appendix containing the annual reports of the State Geologist to the board of commissioners: Pa. Geol. Survey 2nd, A, xxvi, 200 p., 1876. This is a detailed historical account of the geological progress in the Commonwealth up to 1876, especially that of the First Survey by H. D. Rogers.
27. The Boyd's Hills gas well at Pittsburgh [Allegheny County]: Pa. Geol. Survey 2nd, L, p. 217-237, illus., 1876. A 2300-foot well passes through Conemaugh to Chemung sediments. The log is recorded, and correlations with nearby wells are attempted.
28. The brown hematite ore banks of Spruce Creek, Warrior's Mark Run, and Half Moon Run, in Huntingdon and Centre Counties, Pennsylvania . . .: Amer. Phil. Soc., Proc. 14, p. 19-83, 102-107, illus., 1876; reprinted *in* A collection of occasional surveys . . ., by J. P. Lesley: Philadelphia, 1874. Residual limonite occurs in the [Ordovician] and [Silurian] limestones. The original hematite source is uncertain. Individual ore bodies are described in detail.
29. Oil well records . . . of Pennsylvania: Amer. Phil. Soc., Proc. 16, p. 346-380. 1877. Well records from northwestern counties are listed. Each is discussed from the yield standpoint.
30. Notes on a series of analyses of the dolomitic limestone rocks of Cumberland Co.—[Part 1]: Amer. Phil. Soc., Proc. 17, p. 260-266, 1878—[Part 2] 18, p. 114-120, 1879—[Part 3]: Pa. Geol. Survey 2nd, MM, p. 311-361, illus., 1879. A detailed section of Cambro-Ordovician magnesian limestone is measured. The origin of the intercalated limestone and dolomitic limestone is discussed.
31. [Ancient buried river channel crossing the Allegheny River, Armstrong County]: Amer. Phil. Soc., Proc. 18, p. 354, 1879. The preglacial Allegheny and Clarion Rivers were draining northward. The postglacial moraine-dam overflow-waters flowed southward and cut a straight channel at Parker, where previously a curve had existed. The new channel is 100 feet deeper than the original one.
32. [Slab of roofing slate covered with casts of *Buthotrephis flexuosa,* York County]: Amer. Phil. Soc., Proc. 18, p. 365-366, 1879. A fucoid is reported from the [Peach Bottom] slate. This genus is known from the [Ordovician] and Silurian. This species is characteristic of the [Martinsburg]. "Outliers of [Ordovician] rocks are in the Azoics."
33. [The drift phenomena of the United States]: Amer. Phil. Soc., Proc. 18, p. 85-86, 1879. Several isolated patches of gravel lying in Delaware and Chester Counties have a similar elevation of 350 feet. The elevation of the

uppermost Delaware River terrace is similar. Gravel also occurs in Lancaster County. Tidewater was at or above this level when the gravel was deposited. This standing water may have determined the position of the terminal moraine.

34. [The gas well at Murraysville, in Westmoreland County]: Amer. Phil. Soc., Proc. 18, p. 207-208, 1879. A gas well in [Mississippian] rocks is described physically. Production comes from about 100-200 feet above that of the Leechburg well.
35. The origin of pipe ore: Geological Mag. 2nd ser. 6, p. 459-460, London, 1879. Cave deposits of recent time are shown to contain iron-mud sediments. The ores in the Cambro-Ordovician rocks of the Commonwealth are thought to have been formed this way, rather than as residual deposits.
36. A Hudson River fossil plant in the roofing slate that is associated with chlorite slate and metamorphic limestone in Maryland, adjoining York and Lancaster Counties, Pa.: Amer. Jour. Sci. 3rd ser. 19, p. 71-72, 1880. *Buthrotrephis foliosa*, a plant, is mentioned from the [Peach Bottom slate], and the structure of these rocks in Lancaster County is discussed. They are considered to be [Ordovician].
37. Geological map of Cumberland County: scale, 1 inch equals 2 miles, Pa. Geol. Survey 2nd, D 5, 1880. [Precambrian]-[Silurian] and [Triassic] rocks are mapped; iron ore banks are located on the map also.
38. Sur les limites du terrain carbonifière et du terrain permien en Amerique, d'apres l'étude de leurs flores: Internatl. géol. cong., [1st] Paris, C. R., p. 130-135, 1880; discussions, p. 135-136. [Pennsylvanian] and Permian stratigraphy is briefly reviewed; the plants are listed and compared to similar plants in western Europe.
39. Notes on the models exhibited at the meeting Nov. 19, 1880: Amer. Phil. Soc., Proc. 19, p. 193-194, 1882. Models were described and exhibited. They showed in three dimension the relation between the topography and structure in certain parts of the Commonwealth. The models are deposited in the Geological Survey museum.
40. On high-level drift: Geological Mag. 2nd ser. 9, p. 334-336, London, 1882. Glacial drift at elevations above 1,000 feet are described from many places, including the Commonwealth. The article is in answer to a British author who says there is no drift that high.
41. (editor, and others). The geology of Chester Co.: Pa. Geol. Survey 2nd, C 4, xxv, 394 p., illus. incl. geol. map, 1883; review [discussion] by P. Frazer: Amer. Naturalist 17, p. 1020-1027, 1883; discussion with title, Notes on the geology of Chester Valley and vicinity, by T. D. Rand: Acad. Nat. Sci. Phila., Proc. [35] 1883, p. 241-247, 1884; reply by P. Frazer: Franklin Inst., Jour. 117 [3rd ser. 87], p. 303-307, 1884; reply by T. D. Rand, p. 307-309; reply by P. Frazer, p. 309-310; reply by T. D. Rand, p. 310; discussion with title, Mr. Theodore D. Rand's criticism of vol. C 4, by P. Frazer: Franklin Inst., Jour. 116, [3rd ser. 86], p. 274-278, 1883. A complete geologic description of the area is given. Precambrian-Quaternary rocks are described; each township is described in detail. Sections are measured; fossils are listed, and analyses are made. Lead, copper, iron, and serpentine are the chief economic resources; others are also discussed.
42. The geology of Lehigh and Northampton Counties: Pa. Geol. Survey 2nd, D 3, Part 1, p. i-xxiv, 1-82, illus. incl. atlas, 1883. This is a reasonably complete geological report of the two counties. [Precambrian]-[Ordovician], [Pleistocene] rocks are mapped. Physiography is also described in detail, as is some of the structure in the valley limestones.
43. Extracts from a report to Lyon Storb and Co. on the iron ores of Warrior's Mark and Spruce Creek Valley [Centre County] in 1873: Pa. Geol. Survey 2nd, T 4, p. 353-384, illus., 1884. Descriptions of occurrences of limonite from the Ordovician rocks are given. Sketch maps of various properties are included.
44. Notes on the geology of the Schuylkill River, for the use of the members of the American Association for the Advancement of Science, on their excursion to the anthracite coal field, September 6th, 1884: 8 p., illus. [n. p., n. d., 1884?]. A generalized description of the geology to be seen from the railroad along the Schuylkill River from Philadelphia to Pottsville is given.

45. [Quartz pebbles found in coal near Cannelton, Beaver County]: Amer. Phil. Soc., Proc. 21, p. 344, 1884. Goose-egg sized quartz pebbles in coal are attributed to floating tree roots which dropped the enclosed quartz as they rotted.

46. A geological hand atlas of the sixty-seven counties of Pennsylvania: Pa. Geol. Survey 2nd, X, cxii, illus. geol. maps, 1885. A general description of the structure of the Commonwealth is given, with an even briefer discussion of the characteristics of each county, and with sixty-seven small geological maps, one of each county. Scale, 6 miles per inch.

47. (editor, and others). Fifty-six county maps on forty-nine sheets: Pa. Geol. Survey 2nd, Grand Atlas, Div. 1, Part 1, 49 sheets, scale, 1 inch equals about 2 miles, 1885.

48. (editor, and others). Geological index map of the Durham and Reading Hills of South Mountains with bordering valleys of Northampton, Lehigh, Bucks, and Berks Counties: Sheet 1 *of* Pa. Geol. Survey 2nd, Grand Atlas Div. 4, Part 1, scale, 1 inch equals 2 miles, 1885.

49. (editor). Geological map of Berks County: Scale, 1 inch equals 2 miles, *in* Pa. Geol. Survey 2nd, Grand Atlas Appendix, 1885.

50. (editor). Geological map of Huntingdon County: Scale, 1 inch equals 2 miles, *in* Pa. Geol. Survey 2nd, Grand Atlas Appendix, 1885.

51. (editor, and others). Petroleum and bituminous coal fields: Pa. Geol. Survey 2nd, Grand Atlas Div. 3, Part 1, 1885. This is an atlas containing maps, sections, and cross sections published in various bulletins of the 2nd Survey.

52. . . . pressure, quantity, composition, and fuel value of rock gas or the natural gas of the oil regions of Pennsylvania: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 657-680, 1886. A discussion of gas-bearing qualities of rocks and the effect on quantity and quality of the gas contained in them is given. Composition of western Pennsylvania gas is presented.

53. (and D'Invilliers, Edward Vincent). Report on the Cornwall iron ore mines, Lebanon Co.: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 491-570, illus., 1886. Magnetite with valuable impurities is associated with Triassic trap [diabase] which has contact-metamorphosed [Ordovician] limestone. Carbonates of lime were removed and the ore material replaced them. Analyses are given. Iron, cobalt, and copper are the materials obtained.

54. Some general considerations respecting the origin and distribution of Delaware [County] and Chester [County] kaolin deposits: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 571-591, 1886. Kaolin deposits, resulting from weathered feldspar, trend N35°E across the counties. The limestone belts trend N75°W.

55. (and Harden, E. B.). The coal beds and fire clays of the Wellersburg basin, in Somerset Co.: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 227-239, illus., 1886; revision and correction, Pa. Geol. Survey 2nd, HHH Atlas, p. 349-360, 1877 [1889?]. Coal beds in the southeastern part of the county are described. The coal is unimportant but the fire clay is economic. Sections are measured.

56. The geology of the Pittsburgh coal region: Amer. Inst. Mining Engineers, Trans. 14, p. 618-656, illus., 1886. A general discussion of the stratigraphy and the mineral resources of the area is given. Most of the emphasis is on the coal and the [Pennsylvanian] rocks.

57. A dictionary of the fossils of Pennsylvania . . . in reports and catalogues of the survey: Pa. Geol. Survey 2nd, P 4, 3 vols., xiv, 1283 p. [incl. addenda], illus., 1889. Fossils mentioned in survey publications are listed alphabetically, described, and illustrated. The references are included. Fossils from other areas are intercalated.

58. Biographical notice of Charles A[lbert] Ashburner [1854-1889]: Amer. Inst. Mining Engineers, Trans. 18. p. 365-370, 1890.

59. Obituary notice—Charles Albert Ashburner [1854-1889]: Geol. Soc. Amer., Bull. 1, p. 521-523, 1890.

60. Obituary notice of Charles Albert Ashburner [1854-1889]: Amer. Phil. Soc., Proc. 28, p. 53-59, 1890.

61. Obituary notice of Leo Lesquereux [1806-1889]: Amer. Phil. Soc., Proc. 28, p. 65-70, 1890.

62. Artesian well in Lower Silurian limestone at Parkersburg [Chester County], Pa.: Amer. Phil. Soc., Proc. 29, p. 45-47, 1891. The log of a well over 500 feet deep in [Ordovician] limestone is given. Minute mica flakes and an occasional feldspar grain are found in the limestone.
63. (editor, and others). Geological maps of Schuylkill, Carbon, Berks, and Dauphin Cos.: Scale, 1 inch equals 2 miles, [Harrisburg] 1891.
64 Obituary notice of P[eter] W[enrich] Sheafer [1819-1891]: Amer. Phil. Soc., Proc. 29, p. 39-42, 1891.
65. On an important boring through 2000 feet of Trias in [Bucks County] eastern Pennsylvania: Amer. Phil. Soc., Proc. 29, p. 20-24, 1891; discussion by B. S. Lyman, p. 24-25. A detailed record is kept. Sandstone and shale are the chief components, although slate and anthracite are listed. The section is somewhere near the middle of the Triassic group.
66. On the Grapeville gas wells [Westmoreland County]: Amer. Phil. Soc., Proc. 29, p. 11-16, 1891. Data are presented, from which it is shown that a decline in gas pressure is not related to hydrostatic pressure, but rather to the expansion properties of the gas. Much data are given on the depth to the gas sands and on their position on the structure.
67. (and D'Invilliers, Edward Vincent). A summary description of the geology of Pennsylvania: Pa. Geol. Survey 2nd, Final Rpt., 3 vols., xix, p. 1-1915, 2153-2188, 2189-2588, illus. incl. geol. atlas, 1892-1895; discussion with title, The supposed South Chester Valley Hill fault, by T. D. Rand: Acad. Nat. Sci. Phila., Proc. [44] 1892, p. 445-447, 1893; discussion by J. J. Stevenson: Science ns 3, p. 876-877, 1896; reply by E. V. D'Invilliers, ns 4, p. 728-730, 1896. A detailed summary of the geology of the Commonwealth as determined by the Second Survey is given. Each period is discussed in detail as are the many mineral deposits. Vol. 1 is [Precambrian]-Silurian; vol. 2 is Silurian to Devonian; vol. 3, part 1 is Carboniferous; vol. 3, part 2 is Carboniferous to Triassic. Sections are measured; fossil are listed and illustrated. A new state geologic map is compiled. Rand discusses a detail.
68. Memoir of Leo Lesquereux, 1806-1889: Natl. Acad. Sci., Biog. Mem. 3, p. 187-212, 1895.

LESQUEREUX, LEO, 1806-1889. See also Lesley, J. Peter, 22.

1. (and Rogers, Henry Darwin). New species of fossil plants, from the anthracite and bituminous coal-fields of Pennsylvania: Boston Jour. Nat. Hist. 6, p. 409-431, 1857. One hundred ten species are described from the Commonwealth, but no locations are included.
2. Palaeontological report of the fossil flora of the Coal Measures of the Western Kentucky coal field: Ky. Geol. Survey 1854-60, Rpt. 3, p. 499-556, illus., 1857. Fourteen coal beds are described in Kentucky and Illinois and correlated paleobotanically and paleozoologically with the coal beds of the Commonwealth. The distinguishing fossils are described and illustrated from all three areas.
3. Description of the fossil plants found in the anthracite and bituminous coal measures of Pennsylvania, *in* Geology of Pennsylvania 2, by H. D. Rogers: p. 847-878, illus., Philadelphia, 1858. Twenty-eight genera and over two hundred thirty species of plants from the [Pennsylvanian] of Pennsylvania are described and illustrated.
4. General remarks on the distribution of the coal plants in Pennsylvania, and on the formation of coal, *in* Geology of Pennsylvania 2, by H. D. Rogers: p. 837-847, Philadelphia, 1858. Plants which are characteristic of certain levels in the [Pennsylvanian] System throughout North America and Europe are discussed. The flora of specific areas in Pennsylvania is listed. Comparisons are made of the bituminous fields of Pennsylvania with other areas in the United States and Europe.
5. The fossil plants of the Coal Measures of the United States with descriptions of the new species in the cabinet of the Pottsville Scientific Association: 24 p., illus., Pottsville, 1858; extract, *in* Geology of Pennsylvania 2, by H. D. Rogers: p. 878-884, Philadelphia, 1858. The [Pennsylvanian] flora is listed from North America. Several new genera and species from the Commonwealth are described and illustrated. Some coal-correlation is made.

6. On some questions concerning the coal formations of North America: Amer. Jour. Sci. 2nd ser. 28, p. 21-37, 1859; 30 p. 63-74, 367-384, 1860; 32, p. 15-25, 193-205, 1861; 33, p. 206-216, 1862; 35, p. 375-386. 1863. This is a general discussion of the origin of coal. Examples are drawn from the Commonwealth. The problem of allochthonous and autochthonous coal is outlined. Individual groups of plants are described stratigraphically; coal stratigraphy is also mentioned and compared with that of Europe.
7. Report of the fossil flora and of the stratigraphical distribution of the coal in the Kentucky coal fields: Ky. Geol. Survey, Rpt. 4, p. 331-437, illus., 1861; discussion with title, Note on Mr. Lesquereux's table of comparative sections of coal measures, by J. P. Lesley: Amer. Jour. Sci. 2nd ser. 32, p. 281-285, 1861. Comparisons with the coal stratigraphy of the Commonwealth are made. Lesley differs in some of the details. The inclusion of the [Mississippian] Epoch in the [Carboniferous] System is discussed in detail. Lesley thinks it should be separated.
8. [The coal flora of America] [abs.]: Amer. Phil. Soc., Proc. [1862-1864] 9, p. 198-204, 1865.
9. On Fucoides in the coal formations [Lawrence County]: Amer. Phil. Soc., Trans. ns 13, p. 313-328, illus., 1869. A general discussion of the fucoids, their origin, stratigraphic significance, and distribution includes a description of *Caulerpites marginatus* from the [Pennsylvanian] near Wurtemburg.
10. Mode of preservation of vegetable remains in our American Coal Measures: Amer. Naturalist 5, p. 340-353, 1871. A general discussion of the topic includes examples from the Commonwealth. Plants occur: (1) in coal, (2) in shale, (3) in ironstone concretions, and (4) by mineralization or petrification.
11. On the progress of the North American Carboniferous flora: Amer. Phil. Soc., Proc. 16, p. 397-416, 1877. Some of the history and problems encountered by the author are described in the text. A resumé of the major groups of plants in the Commonwealth is given. This is essentially a synopsis of Bulletin P of the Second Geological Survey.
12. A species of fungus recently discovered in the shales of the Darlington coal bed (lower Productive Coal Measures, Allegheny series) at Cannelton, in Beaver Co., Pa.: Amer. Phil. Soc., Proc. 17, p. 173-175, illus., 1878; Pa. Geol. Survey 2nd, Q, p. xlvii-li, illus., 1878. A fungus, *Rhizomorpha sigillariae,* is new, and was found within the bark of a *Sigillaria.* There is little doubt as to its affinities.
13. On the Cordaites and their related generic divisions in the Carboniferous formations of the United States: Amer. Phil. Soc., Proc. 17, p. 315-335, illus., 1878. A general treatise on this group of plants includes the Commonwealth.
14. On a branch of *Cordaites,* bearing fruit [Beaver County]. Amer. Phil. Soc., Proc. 18, p. 222-223, illus., 1879. *Cordaites costatus* with fruit from Cannelton is described and illustrated.
15. Description of the coal flora of the Carboniferous formation in Pennsylvania and throughout the United States . . .: Pa. Geol. Survey 2nd, P, 3 vols., lxiii, 977 p., atlas [1879], 1880-84. Detailed descriptions and illustrations of several hundred fossil plants, includes locations. A general discussion of their stratigraphic and geographic distribution is included.
16. On the character and distribution of Paleozoic plants: Pa. Geol. Survey 2nd, Ann. Rpt. 1886, Part 1, p. 457-522, 1887. A generalized discussion of Paleozoic plants includes Pennsylvania locations and types. All phyla are present, most being in the Pennsylvanian. There is a discussion of many which are figured in atlas of bulletin P.
17. Fossil plant collection, *in* Catalogue of the geological museum, Part 3: Pa. Geol. Survey 2nd, OOO, p. 99-122, 1889. This is a catalog of the plants illustrating report P of the Survey. No locations are given in detail.

LEVAN, L. A.

1. Panther Valley [Schuylkill-Carbon Counties] geology: Mining Cong. Jour. 16, p. 581-583, illus., 1930. A review, including cross sections of this part of the southern field is given. The chevron folding and thrust faulting are illustrated, and their relations to the mining problems are explained.

LEVENE, CLARA MAE. See Schuchert, Charles, 22.

LEVERETT, FRANK. See also Chamberlin, Thomas Chrowder, 5; Foshay, P. Maxwell, 2; Ward, Freeman, 3; Wright, George Frederick, 13.

1. Glacial formations and drainage features of the Erie and Ohio basins: U. S. Geol. Survey, Mon. 41, 802 p., illus. incl. geol. map, 1902. The area north and west of the Ohio and Allegheny Rivers is included. A complete description of the glacial deposits is given, along with the glacial history of the region. Three drift sheets are recognized, as are many substages. Terraces and lake deposits are also described.
2. Glacial gravels, *in* Geology and mineral resources of the Kittanning quadrangle [Armstrong, Butler, and Clarion Counties]: U. S. Geol. Survey, Geol. Atlas of U.S. folio 115, p. 9-10, 1904. Glacial gravels are on the uplands bordering the Allegheny River. They may be of Kansan or pre-Kansan age. The thickness is 110 to 130 feet at least, and possibly more. It is mostly medium to fine gravel, containing some sand. An occasional boulder is evident. Granite and greenstone are present in it. This gravel is capped in places by Wisconsin outwash material.
3. Results of glacial investigations in Pennsylvania and New Jersey in 1926 and 1927 [abs.]: Geol. Soc. Amer., Bull. 39, p. 151, 1928; Pan-Amer. Geologist 49, p. 66-67, 1928.
4. Problems of the Upper Ohio drainage [abs.]: Pan-Amer. Geologist 52, p. 371, 1929; Geol. Soc. Amer., Bull. 41, p. 167, 1930.
5. Glacial deposits outside the Wisconsin terminal moraine in Pennsylvania: Pa. Geol. Survey 4th ser., G-7, vi, 123 p., illus., 1934. A review of previous work is followed by detailed descriptions of various types of deposits [older] than Wisconsin. The drift in the various river basins, terraces, pondings, moraines, etc., of Illinoian age is recognized. Pre-Illinoian drift is also described and mapped. Pre-glacial drainage is also discussed.
6. Correlation of beaches with moraines in the Huron and Erie basins [Erie County]: Amer. Jour. Sci. 237, p. 456-475, illus. incl. geol. map, 1939. A resumé of all work on Pleistocene beaches and moraines around the Great Lakes, includes Erie County. The various beaches are mapped, described, and correlated with one another.
7. Stream capture and drainage shifting in the upper Ohio region: Jour. Geomorphology 2, p. 339-344, illus., 1939. Numerous examples of stream capture and of stream diversion from glacial damming and other effects are shown in the development of the Ohio River in western Pennsylvania.

LEVORSEN, ARVILLE IRVING

1. Pennsylvanian overlap in the United States: Amer. Assoc. Petroleum Geologists, Bull. 15, p. 113-148, illus., 1931; discussion by J. M. Weller, p. 704-707. The Commonwealth is included among many other areas. The Pottsville Formation thins northwestward from overlap by the overlying units. Mississippian rocks thin northwestward also, and Pennsylvanian rocks rest on Devonian rocks in the northwestern corner of the Commonwealth. Cross-sections are included. Pre-Pennsylvanian folding and the source of Pennsylvanian sediments are discussed.
2. (editor). Stratigraphic type oil fields: xii, 902 p., illus., Tulsa, Okla., 1941. This contains papers by C. R. Fettke and R. E. Sherrill (and others), which are cited individually.

LEVY, LOUIS EDWARD

1. In memoriam—Angelo Heilprin [1853-1907]: Franklin Inst., Jour. 164, p. 313-326, port., 1907.

LEWIS, HENRY CARVILL, 1853-1888. See also Rand, Theodore Dehon, 11; White, Israel Charles, 11.

1. On strontianite and associated minerals in Mifflin Co.: Acad. Nat. Sci. Phila., Proc. [28] 1876, p. 11-12, 1876. White acicular tufts of strontianite occur in pockets in limestone or disseminated in shale. Associated with it are aragonite, fluorite, calcite, and others. The previously reported strontianite in Montgomery County is probably barite.
2. The antiquity of man in eastern America, geologically considered [abs.]: Science (ed. Michels) 1, p. 192-193, 1880; Amer. Assoc. Adv. Sci., Proc. 29,

p. 706-709, 1881. Implements are found in the Trenton gravel of the Delaware River. The Trenton gravel is shown to be post-glacial in age.

3. A new locality for asbolite [Montgomery County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 243, 1881. Asbolite is reported in iron ore mines as an incrustation on psilomelane. Much cobalt is evident. The locality is near Flourtown.
4. A new locality for epsomite [Huntingdon County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 257, 1881. Epsomite occurs as small, colorless, acicular crystals in the lower [Pocono] Formation at Sideling Hill tunnel.
5. A new locality for lignite [Montgomery County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 281, 1881; Mineralogy and Geol. Sec., Proc. no. 1, p. 45, 1881. A stratum four feet thick was encountered after a shaft of 38 feet had been sunk near Marble Hall. The stratum contained randomly oriented lignite in tough black fire clay. Pyrite is also present. Its age is uncertain. It may be Tertiary or Jurassic.
6. A new locality for siderite [Fayette County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 242, 1881. Siderite occurs as fine crystals in nodules of amorphous siderite. Quartz and pyrite crystals are also present. The locality is near Dunbar.
7. Epidote in molybdenite [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 243, 1881. Molybdenite from Frankford contains plates of transparent, light greenish-yellow, hard epidote. It occurs as plates between the molybdenite laminae and as a thin film of coating.
8. On a Jurassic sand [Bucks County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 279, 1881. A sand unit occurs below basal Cretaceous beds near Elkton, Md. The basal Cretaceous is a plastic clay which also is at Turkey Hill, in Bucks County.
9. On an exfoliating talc [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 252-253, 1881; Mineralogy and Geol. Sec., Proc. no. 1, p. 16-17, 1881. Talc occurs in a quarry near Manayunk. It occurs in fan-like crystals in dolomite. When heated it exfoliates, resembling pyrophyllite. Its optical properties are described. The exfoliation is related to the combined water in it.
10. On dendrites [Montgomery County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 278-279, 1881. White Triassic sandstone in Norristown contains manganese oxide dendrites which appear to have developed from vertical capillary action. No crystalline structure is apparent in most. A few have a shape controlled by the crystal structure of the manganese mineral.
11. On philadelphite (sp. nov.) [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 310, 313-328, 1881; Mineralogy and Geol. Sec., Proc. no. 1, p. 74, 77-92, 1881; analysis by R. Haines, p. 310. A new mineral in the vermiculite group is completely described. It occurs as disseminated scales and in seams up to several feet long. It is in hard, black, hornblende gneiss. It is probably derived from hornblende.
12. On serpentine in Bucks Co.: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 281, 1881; Mineralogy and Geol. Sec., Proc. no. 1, p. 45, 1881. An outcrop of serpentine in the county near Flushing is reported. The genesis of the serpentine and its relation to the gneissic rocks is uncertain.
13. On some enclosures in mica [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 278, 1881. Muscovite, from Germantown, contains crystals of lepidomelane. The crystals are arrow-shaped, and some are shaped like a musket.
14. On the Bryn Mawr gravel: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 277-278, 1881; Mineralogy and Geol. Sec., Proc. no 1, p. 41-42, 1881. This formation, while extensively developed in Delaware, is to be found in southeastern Pennsylvania. It is scantily present in Bucks County and increases in volume southward. It generally caps hills. It contains boulders of local bedrock.
15. The iron ores and lignite of the Montgomery Co. valley: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 282-291, 1881; Mineralogy and Geol. Sec., Proc. no. 1, p. 46-55, 1881. Lignite, enclosed in clay, overlies residual iron ore layers and underlies decomposed schist fragments and “top dirt” [Bryn Mawr gravel]. Regional correlations suggest a Brandon [Oligocene] age for the lignite.

16. The surface geology of Philadelphia [Philadelphia County] and vicinity: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 258-272, illus., 1881; Mineralogy and Geol. Sec., Proc. no 1, p. 22-36, illus., 1881. The following surficial deposits are present and are described. Something of their origin is considered. They are: (1) Upland terrace, (2) Recent alluvium, (3) river gravel, (4) red gravel and brick clay, (5) fossiliferous gravel, (6) Branchtown clay, and (7) Bryn Mawr gravel. The Bryn Mawr gravel and Branchtown clay are probably older.
17. The Trenton gravel and its relation to the antiquity of man: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 296-309, 1881. The Trenton gravel is the most recent of the surficial river deposits in the Delaware Valley area. It formed in post-glacial time. It is called River gravel and sand in earlier papers. Paleoliths(?) are found in Bucks County in the gravel. An extreme antiquity is not proposed, however.
18. Vanadium in Philadelphia [Philadelphia County] rocks: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 256-257, 1881; Mineralogy and Geol. Sec., Proc. no. 1, p. 20-21, 1881. Vanadium is reported in sphene-bearing hornblende gneiss in Germantown.
19. A new locality for hyalite [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 49, 1882. Hyalite occurs as green, glassy coatings on hornblende gneiss in a quarry in Germantown.
20. New localities for barite: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 38, 1882. Barite occurs in Catskill beds near Bridgeport, Bedford County, on the Pennsylvanian plant fossils in Huntingdon County, and at Lancaster Station, Franklin County.
21. New localities for gypsum [Northampton County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 38, 1882. Among other places in the United States, gypsum occurs as tabular crystals from a quarry near Easton.
22. Note on aquacreptite: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 56-57, 1882; Mineralogy and Geol. Sec., Proc. no. 2, p. 23-24, 1882. The known occurrences of this mineral are described. There seems to be no petrogenetic continuity. The varying physical properties are described, mostly the rate of decrepitation.
23. Note on autunite [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 49, 1882. The optical properties of autunite from Fairmount are described.
24. Note on halotrichite [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 50, 1882. Halotrichite occurs as fine incrustations on hornblende gneiss in Fairmount Park and as an impure efflorescence in the West Jersey marl pits.
25. On a fault in the Trias near Yardleyville [Bucks County], Pa.: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 40-41, illus., 1882; Mineralogy and Geol. Sec., Proc. no. 2, p. 7-8, illus., 1882; discussion with title, The Yardley fault, by B. S. Lyman: Amer. Phil. Soc., Proc. 34, p. 381-384, illus., 1895. Diabase separates two distinct lithologic units, and even turns one variety upward, resembling drag. The dike created the fault in pushing its way to the surface. Lyman claims it is a normal fault of small magnitude and is unassociated with the dike as far as its genesis is concerned.
26. On a new substance resembling dopplerite from a peat bog at Scranton [Lackawanna County]: Amer. Phil. Soc., Proc. 20, p. 112-117, 1882; Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 52-53, 1882; Mineralogy and Geol. Sec., Proc. no. 2, p. 19-20, 1882; discussion with title, On phyctolite, a new mineral, p. 68; Pa. Geol. Survey 2nd, Ann. Rpt. 1855, p. 647-656, 1886. A substance has resulted from the decomposition of peat. It resembles dopplerite. Analysis shows it to be new and it is called phyctolite, a group name to include substances like dopplerite.
27. On the occurrence of fahlunite near Philadelphia [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 51-52, 1882; Mineralogy and Geol. Sec., Proc. no. 2, p. 18-19, 1882. Fahlunite, as a pseudomorph by alteration after orthoclase, is described from quarries in Germantown.
28. On two new localities of columbite [Delaware County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 51, 1882; Mineralogy and Geol. Sec., Proc. no. 2, p. 18, 1882. A single, doubly-terminated crystal is described from Mineral Hill.
29. Pseudomorphs of serpentine after dolomite [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 36-38, 1882; Mineralogy and Geol. Sec., Proc.

no. 2, p. 3-5, 1882. Serpentine with dolomite cleavage in dolomite rocks is reported. Gradations are not evident. When broken, the pseudomorphs do not have rhombohedral cleavage. This is a pseudomorph by substitution rather than replacement.

30. On a supposed human implement from the gravel at Philadelphia [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [35] 1883, p. 40-43, 1883. An object from the glacial clay in the city is described. It appears to be artificial but could be natural. No opinion should be made until more evidence is found. The use of the implement is uncertain.
31. Some enclosures in muscovite: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 311-315, illus., 1883. A biotite-bearing muscovite is examined optically. The crystallography of the two is parallel. The biotite is being resorbed by the muscovite. Magnetite occurs also, as reticulations from muscovite in Delaware and Chester Counties. The magnetite conforms crystallographically, but is independent of the muscovite.
32. The geology of Philadelphia [Philadelphia County]: Franklin Inst., Jour. 115 [3rd ser. 85], p. 359-374, 422-427, 1883; review [discussion] by P. Frazer, Science 2, p. 269-270, 1883; reply by author, p. 402-403; reply by P. Frazer, p. 540; reply by author, p. 652-653. An address in which the rocks from [Precambrian] to [Quaternary] are described. The surficial terrace deposits are considered in detail. Human (?) implements come from some of the gravels. Frazer disagrees with certain terminology.
33. The great ice age in Pennsylvania: Franklin Inst., Jour. 115 [3rd ser. 85], p. 287-307, illus., 1883. This is an abstract of an address about the glacial phenomena found in the Commonwealth. Various glacial features are mentioned and described. Causes and length of duration are considered.
34. The great terminal moraine across Pennsylvania [abs.]: Science 2, p. 163-167, illus., 1883; Amer. Assoc. Adv. Sci., Proc. 31, p. 389-398, illus., 1883. The moraine location across the northern part of the Commonwealth is described. The [Illinoian] till is not separated from the [Wisconsin] till. Specific areas are mentioned, but little detail is given.
35. [Fossils in the Triassic shale of Phoenixville, Chester County]: Science 3, p. 295, 1884. Five [clams], a ganoid fish, some plants, and reptile bone fragments are reported from the [Brunswick] Formation. None are described. Some are considered as marine and some as terrestrial.
36. On supposed glaciation in [southeastern] Pennsylvania south of the terminal moraine: Amer. Jour. Sci. 3rd ser. 28, p. 276-285, illus., 1884. The hypothesis of no glaciation south of the terminal moraine is supported by explaining eleven "glacial phenomena" by other means and by showing that other authors misidentified features.
37. Report on the terminal moraine in Pennsylvania and western New York: Pa. Geol. Survey 2nd, Z, lvi, 299 p., illus. incl. geol. maps, 1884; abstract with map, Amer. Phil. Soc., Proc. 20, p. 662-664, 1883. The glacial epoch in Pennsylvania is described. Its extent is traced by the terminal moraine which enters the Commonwealth at Northampton County, proceeds northwestward to Potter County where it inters New York. It returns in Warren County and trends southwestward to Beaver County where it enters Ohio. Local areas are discussed in detail.
38. A great trap dyke across southeastern Pennsylvania: Amer. Phil. Soc., Proc. 22, p. 438-456, illus. incl. geol. map, 1885; discussion with title, Trap dykes in the Archean rocks of southeastern Pennsylvania, by P. Frazer, Jr., Proc. 21, p. 691-694, 1884; discussion with title, The Chalfont fault rock, so-called, by B. S. Lyman: Proc. 34, p. 384-388, illus., 1895. A dike extending from Maryland to Doylestown and beyond is ninety miles long. It is Jurassic in age because it is associated with faults which are post-Triassic. The dike is also faulted. Magnetite and pyrite are present. The faults are described in detail. Lyman discusses some details of the fault breccias and says they are not fault breccias.
39. Erythrite, genthite, and cuprite from near Philadelphia: Acad. Nat. Sci. Phila., Proc. [37] 1885, p. 120-122, 1885. Erythrite is reported from near Phoenixville, Chester County. Genthite is reported as a coating on an actinolite-rock in a

steatite quarry in Montgomery County. Cuprite occurs as a coating in a hornblende gneiss quarry in Philadelphia County.

40. Marginal kames: Acad. Nat. Sci. Phila., Proc. [37] 1885, p. 157-178, illus. geol. map, 1885. A general discussion of the origin and description of kames is given. Those in Pennsylvania are discussed in detail. They are in close proximity to the terminal moraine, hence the name. Five are described from Northampton County, many from Monroe County, one from Mercer County, and many from Potter County.
41. Some examples of pressure fluxion in [Montgomery, Bucks, and Chester Counties] Pennsylvania: British Assoc. Adv. Sci., Rpt. 55, p. 1029-1030, London, 1886. The outer [younger] edges of the crystalline rocks are gneissic as a result of the pressures which folded the Appalachians. *Scolithus* tubes are distorted accordingly, along with other evidence of metamorphism which is cited.
42. Glacial drift collections (to accompany report Z, 1884), *in* Catalogue of the geological museum, Part 3: Pa. Geol. Survey 2nd, 000, p. 19-24, 1889. This is a catalog of specimens collected by Carll and contained in the museum.

LEWIS, JOSEPH VOLNEY. See also Stose, George Willis, 15.

1. Corundum of the Appalachian crystalline belt: Amer. Inst. Mining Engineers, Trans. 25, p. 852-906, 1896. A detailed discussion of the occurrence of corundum in basic igneous rocks and pegmatites includes a brief description of the occurrence in Chester County at Unionville.

LEWIS, JULIA F.

1. H. Carvill Lewis's work on the glacial phenomena: Science 19, p. 305-307, 1892. The fringe [pre-Wisconsin drift] is caused by extramorainic lakes from south-flowing streams.

LEWIS, SAMUEL

1. The cause of certain markings in coal [Lackawanna County]: Pottsville Science Assoc., Bull. Jan.-Feb. 1855, p. 14, 1855. Grooves on coal are described not as attributed to the rubbing action of the coal fragments when the coal beds were folded but rather to impressions of vegetable fiber.

LEWIS, THOMAS J.

1. Philadelphia quartz: Mineral Collector 12, p. 69-72, 1905; 13, p. 111, 1906. Quartz crystals are described from somewhere near Overbrook. The locality and stratigraphy are not clear. Milky and smoky quartz crystals are common.
2. Pyromorphite at the Brookdale [Chester County] lead mine: Rocks and Minerals 12, p. 234-235, 1937. Sixteen varieties of crystal shapes are listed from one of the old Wheatley mines.

LIGHTFOOT, T. M.

1. A treatise on our local geology [Delaware County]: [9 p.], [n. p., n. d. 1909?]. An extremely generalized description of the county is given. Precambrian-Recent rocks are discussed, as are some of the minerals. It is completely descriptive.

LILLEY, ALBERT TELL, 1838-1922.

1. Detailed section of Chemung rocks exposed in the Gulf Brook gorge at LeRoy, Bradford Co., Pennsylvania: Amer. Phil. Soc., Proc. 21, p. 304-305, 1883; revised, 23, p. 291-293, 1886. Over 2,000 feet of Upper Devonian rocks are measured, and the fossils are listed. Red and green shale and sand are common.

LILLEY, ERNEST RAYMOND

1. Petroleum provinces of the United States: Engineering and Mining Jour. Press 116, p. 243-245, illus., 1923. A review of the provinces, including that in which the Commonwealth is located, is made. No details are given.

LINDGREN, WALDEMAR

1. James Furman Kemp [1859-1926]—to his memory: Economic Geology 22, p. 84-90, 1927.
2. Biographical memoir of George Perkins Merrill, 1854-1929: Natl. Acad. Sci., Biog. Mem. 17, p. 33-53, port., 1937.

LINDSTROM, G.

1. Öm lantaniten [Lehigh County]: Geol. Föreningens i Stockholm, Förh. 32, p. 206-214. Stockholm, 1911 [in Swedish]. A resumé of the mineral lanthanite includes a description of that from near Bethlehem.

LINES, EDWIN F. See also Fuller, Myron Leslie, 9; Shaw, Eugene Wesley, 4.

1. Clays and shales of Clarion quadrangle, Clarion County, Pa.: U. S. Geol. Survey, Bull. 315, p. 335-343, 1907. Clay occurs in the Pennsylvanian rocks of the area. A little shale is also mined. Plastic clay and flint clays are described from several areas. They are generally just below coal beds.
2. Coals of the Clarion quadrangle, Clarion County, Pa.: U. S. Geol. Survey, Bull. 316, p. 13-19, illus., 1907. Pennsylvanian rocks are described in detail. Individual coal beds are described.

LINN, ALONZO

1. (and Linton, Edward). Notes on the Mountain limestone (at the base of no. XI) in the Washington Co. gas wells: Pa. Geol. Survey 2nd, Ann. Rpt. 1885, p. 222-225, 1886. A siliceous limestone [Loyalhanna] is reported from wells 1,100 feet below the Pittsburgh coal. Thin sections are described.

LINTON, EDWARD. See Linn, Alonzo, 1.

LJUNGSTEDT, OLOF AXEL. See Stose, George Willis, 30.

LOBECK, ARMIN KOHL

1. Geologic map of the United States, text on reverse side: Scale, 1:5,000,000, Geog. Press, New York, 1941.
2. Douglas [Wilson] Johnson [1878-1944]: Assoc. Amer. Geog., Annals 34, p. 216-222, port., 1944.
3. Geological diorama of the United States: 1 sheet with text, Geog. Press, New York, 1948. A three-dimensional view of the United States along a cross section which passes through the Commonwealth is given.

LOGAN, WILLIAM EDMOND, 1798-1875.

1. On the coal fields of Pennsylvania and Nova Scotia: Geol. Soc. London, Proc. 3, p. 707-712, 1842; Geologist 1842, p. 169-174, London, 1842. A brief review of the stratigraphy and coal-bearing beds of the Commonwealth is given.
2. (and Hall, James). Geological map of Canada and the northern United States: Scale, 1:1,584,000 (1 inch equals 25 miles), Canadian Geol. Survey, 1866 [1869].

LOGUE, THOMAS A.

1. [Pa.] Survey reaches 100th birthday: Pa. Dept. Internal Affairs, Monthly Bull. 1, no. 5, p. 3-8, 1936. A very brief, popular account of the State Surveys.

LOHMAN, STANLEY WILLIAM

1. Ground water in northeastern Pennsylvania: M.S. thesis, Calif. Inst. Tech., 1938; (with analysis by M. D. Foster, L. A. Shinn, and K. T. Williams): Pa. Geol. Survey 4th ser., W 4, vi, 312 p., illus. incl. geol. map, 1937. Ordovician-Pennsylvanian, and Pleistocene sediments are present. Each is described and its water-bearing properties are discussed. Each county is described and its water resources are discussed. Analyses are given.
2. Ground water in south-central Pennsylvania, with analyses by E. W. Lohr: Pa. Geol. Survey 4th ser., W-5, v, 315 p., illus. incl. geol. map, 1938. A generalized regional report is given, with emphasis on the water-bearing properties of the various formations. Each county is described separately.
3. Ground water in north-central Pennsylvania, with analyses by E. W. Lohr: Pa. Geol. Survey 4th ser., W 6, viii, 219 p., illus. incl. geol. maps, 1939. Ordovician-Pennsylvanian, and Pleistocene rocks are present. Each is described and its water-bearing properties are discussed. Glacial deposits are important. Each county is discussed in relation to the ground water resources present. Analyses are made.
4. Water resources [Tyrone quadrangle, Blair, Centre, and Huntingdon Counties]: Pa. Geol. Survey 4th ser., Topog. Geol. Atlas 96, p. 110-111, 1939. Large limestone springs are present; the Oriskany sandstone is porous and serves as an aquifer.
5. Ground-water resources of Pennsylvania: Pa. Geol. Survey 4th ser., W 7, p. vi, 1-32, illus., 1941. This is a generalized resumé of the water-bearing properties of the various rock systems of the Commonwealth. This is a summary of reports W 1-W 6, published by the Survey.

LOHR, EDWIN WALLACE. See Lohman, Stanley William, 2, 3.

LONGWELL, CHESTER RAY

1. Some problems of mountain structure and mountain history: Amer. Jour. Sci. 5th ser. 19, p. 419-434, illus., 1930. In a general discussion of tectonic problems, examples from the Commonwealth are used. Whether the original Appalachian

Mountains stood higher, or were eroded as they rose is one of the questions discussed. They were not raised extremely high as approximate isostatic balance was probably maintained during the crustal shortening.

2. (Chairman, and others). Tectonic map of the United States, 2 sheets: Scale, 1:2,500,000, Amer. Assoc. Petroleum Geologists, Tulsa, 1944; discussion with title, Remarques sur la structure du continent nord-Americian, á propos de la carte tectonique des Etats Unis du National Research Council, by P. Béthune: Soc. Belge de Geol., Bull. 54, p. 185-191, illus., Brussels, 1945.

LOOMIS, FREDERIC BREWSTER

1. Physiography of the United States: viii, 350 p., illus., Doubleday-Doran Co., Garden City, New York, 1937. In a general, regional discussion of the United States, the Commonwealth is included.

LORD, NATHANIEL WRIGHT

1. (and others). Analyses of coals in the United States with descriptions of mine and field samples collected between July 1, 1904, and June 30, 1910, 2 vols.: U. S. Bur. Mines, Bull. 22, 1200 p., 1913. Coal samples from many places, including the Commonwealth are described and analyzed.

LOVE, SAMUEL KENNETH. See Leggette, Ralph Maxwell, 1.

LOVEJOY, ELLIS

1. Notes on fire clays of the northern Appalachian coal basins: Amer. Ceramic Soc., Jour. 2, p. 374-385, illus., 1919; discussion by R. R. Hice, p. 385-386; reply by author, p. 389-390; discussion by G. H. Ashley, p. 790-793. The properties of fire clays are discussed. The chief sources in the Commonwealth are: (1) the Mercer [member], (2) the Lower Kittanning [member], and (3) the Upper Freeport [member]. Correlation problems are mentioned, as are physical and chemical differences. Theories of origin are reviewed. Ashley agrees in general but questions some of the correlations, as others are also possible. While Lovejoy stresses Stout's coal-association origin, Ashley believes they are altered sedimentary clays.

LUCAS, D. JONES

1. On a map and profile of a line of levels through Butler, Armstrong, and Clarion County oil fields; with a geological [cross] section from well-drillings: Pa. Geol. Survey 2nd, J, p. 79-89, illus., 1875. Various sand strata are traced along the route of a pipe line and elevations on them are used to determine dips. A cross section is presented to show the [Mississippian] and Devonian strata along the way.

LUCKE, JOHN BECKER

1. Natural gas and geology, with particular reference to the significance of the new fields in New York and Pennsylvania: Gas-Age Record 68, p. 899-902. illus., 1931. The geology of the Farmington gas field in Tioga County is described as an example of a wildcat operation. Gas comes from a dome in the Devonian [Oriskany sandstone].

LUDLUM, JOHN C.

1. Igneous intrusions in the vicinity of Easton [Northampton County], Pennsylvania: B.S. thesis, Lafayette College, 1935.

LUTZ, KATHERINE

1. A distribution of crustal shortening in the Appalachians of Pennsylvania. Maryland, and part of West Virginia: M.A. thesis, Bryn Mawr College, 1948.

LYELL, CHARLES, 1797-1875. See also King, Albert T., 3.

1. [Some of the phenomena connected with the Coal Measures and older strata of Pennsylvania]: Geologist 1842, p. 25-27, London, 1842; Geol. Soc. London, Proc. 3, p. 554-558, 1842; Phil. Mag. 3rd ser. 21, p. 306-309, London, 1842. A brief description of the [Pennsylvanian] strata in the anthracite area is given. Generalizations about correlation with Europe are included. The *Stigmaria*-bearing fire clays are considered in detail.
2. Travels in North America in the years 1841-42, with geological observations on the United States, Canada, and Nova Scotia: 2 vols., 251 p., 221 p., illus., Wiley and Putnam, New York, 1845; 2 vol., 316 p., 272 p., illus., London, 1845; German ed., 395 p., Halle, 1846 [also later editions]. In a travel narrative, occasional points of geologic interest are included from the Commonwealth. The anthracite regions are discussed mostly.

3. On footmarks discovered in the Coal Measures of [Westmoreland County] Pennsylvania: Geol. Soc. London, Quarterly Jour. 2, p. 417-420, 1846. The tracks reported by King from the [Pennsylvanian] are further described. Cheirotherian mammals, birds, and reptiles are discussed, and all are discredited.
4. On the fossil footmarks of a reptile in the coal formation of the Allegheny Mountains [Westmoreland County]: Athenaeum 1848, p. 166-167, London, 1848. The footprints are found in [Pennsylvanian] sandstone along with plants. They are considered reptilian.

LYMAN, BENJAMIN SMITH, 1835-1920. See also Brainerd, Jehu, 1; Gilbert, Grove Karl, 1; Lesley, J. Peter, 65; Lewis, Henry Carvill, 25; Peckham, Stephen Farnham, 2.

1. On the great Carboniferous conglomerate in Sullivan Co., Pa.: Acad. Nat. Sci. Phila., Proc. [19] 1867, p. 125-127, 1867. The Pottsville conglomerate is present in the county. It previously had been unrecognized. The pebble member can be traced for a long distance across the county where its facies change to coal and shale in part is evident.
2. Report on the New Boston and Morea coal lands in Schuylkill Co., Pa.: Pa. Geol. Survey 2nd, Ann. Rpt. 1887, p. 37-91, illus. incl. geol. map, 1889. A complete description of a part of the western anthracite field near New Boston and Morea is given. A large syncline has preserved [Pennsylvanian] rocks and coal. Sections are measured; correlations are made.
3. A geological and topographical map of the New Boston and Morea coal lands in Schuylkill County, Penna.: Scale, 1 inch equals 400 feet [priv. pub.], Philadelphia, 1889.
4. An occurrence of coarse conglomerate above the Mammoth anthracite-bed [Schuylkill County]: Amer. Inst. Mining Engineers, Trans. 21, p. 713-719, illus., 1893. A pebbly sandstone above the Mammoth bed is shown by mapping and drill cores. Its source as channel fill is considered.
5. [Report on the] Shippen and Wetherill [coal] tract [Schuylkill County]: 31 p., illus. incl. geol. map, Sherman and Co., Philadelphia, 1893. The structure, stratigraphy, and coal beds are described. Sections are measured.
6. Some New Red horizons [Montgomery County]: Amer. Phil. Soc., Proc. 33, p. 192-215, illus. incl. geol. maps, 1894. Comparison of the various Triassic areas of the eastern U. S. with the Triassic of Montgomery County is made. Fossils are listed from many areas.
7. Report on the New Red of Bucks and Montgomery Counties: Pa. Geol. Survey 2nd, Summary Final Rpt. 3, Part 2, p. 2589-2638, illus. incl. geol. maps, 1895. In a complete discussion of the Triassic beds, small units are described. The diabase is discussed in detail. Dolerite, gabbro, and epidiorite are common differentiates. Stone, lead, zinc, copper, gold, and umber are economic products.
8. Folds and faults in Pennsylvania anthracite beds: Amer. Inst. Mining Engineers, Trans. 25, p. 327-369, 1010-1011, illus., 1896. NW-SE cross sections across the anthracite fields show 43 percent of the folds are symmetrical, 42 percent have steeper northwestern dips, and 14 percent have steeper southeastern dips. The structures in the four fields are compared. All the faults are longitudinal and reverse, and result from the breaking of minor folds in the basins.
9. Copper traces in Bucks and Montgomery Counties: Franklin Inst., Jour. 146, p. 416-423, illus., 1898. Copper traces are located specifically. They occur as very narrow veins and disseminations. They are mostly located in the Perkasie and Gwynedd [Triassic] shales. The copper beds are related to the beds containing much carbonaceous matter.
10. The Raubsville cave [Northampton County]: Acad. Nat. Sci. Phila., Proc. [52] 1900, p. 464, 1900. A cave in the Cambro-Ordovician limestone is described. Little deposition has taken place. No undisturbed glacial traces have persisted. It is not certain whether the ice reached this area or not.
11. Accounting for the depth of the Wyoming buried valley [Luzerne County]: Acad. Nat. Sci. Phila., Proc. 54, p. 507-509, 1902. The buried valley of the ancient Susquehanna River is, in certain places, deeper than the outlets. Previous explanations are reviewed and rejected. Post-glacial folding which accentuates the valley depth is proposed.

12. Lodel and Skippack Creek [Montgomery County]: Acad. Nat. Sci. Phila., Proc. 53, p. 604-607, 1902. Dinosaur tracks are described from Triassic shale which is ripple-marked. A fossil cycad comes from nearby; it could be *Pterophyllum spatulatum*. Rain-drop impressions are also present. In sum, the deposit is considered estuarine.
13. Biographical notice of J. Peter Lesley [1819-1903] [abs.]: Amer. Inst. Mining Engineers, Trans. 34, p. 726-739, 1904; in full as advance separate, 35 p., 1903.
14. The original southern limit of the Pennsylvania anthracite beds: Amer. Inst. Mining Engineers, Trans. 33, p. 561-567, illus., 1903. Stratigraphic and sedimentation principles are used to suggest that the southern limit was not much farther south than it is now. The Pottsville pebbles could not have been carried far, and therefore, the source area must have been nearby.

LYMAN, FRANK

1. Benjamin Smith Lyman [1835-1920]: Mining and Metallurgy 170, p. 23-24, 1921.

McCASKEY, H. D.

1. Geology of the iron ore deposits of Durham [Bucks County], Pennsylvania: B.S. thesis, Lehigh Univ., 1907.

MacCLINTOCK, PAUL

1. Glacial map of North America—[Part] 5, Northeastern United States [abs.]: Geol. Soc. Amer., Bull. 52, p. 1921-1922, 1941.

McCREATH, ANDREW SMITH. See also Frazer, Persifor, Jr., 16.

1. Report of progress in the laboratory of the Survey at Harrisburg: Pa. Geol. Survey 2nd, M, 105 p., 1875. Analyses of coal, iron ore, limestone, fire clay, and a few miscellaneous items from various parts of the Commonwealth are given.
2. Analyses of coal, cannel, coke, clay, limestone, and ore from Butler and Beaver Counties, Pa.: Pa. Geol. Survey 2nd, Q, p. 275-283, 1878. Very detailed analyses of materials mentioned by White in report Q, 1878, are given.
3. Second report of progress in the laboratory of the Survey at Harrisburg: Pa. Geol. Survey 2nd, MM, p. i-xi, 1-127, 159-269, 279-310, 363-381, 403, illus., 1879. Analyses of coal, iron ore, clay, zinc ore, lead ore, limestone, and some miscellaneous materials from various parts of the Commonwealth are given.
4. An analysis of a *pure* dolomite exposure, in mass, in Franklin Co.: Amer. Phil. Soc., Proc. 19, p. 197, 1881. An analysis is given. True dolomites are rare in the county.
5. Third report of progress in the laboratory of the Survey at Harrisburg: Pa. Geol. Survey 2nd, M3, 126 p., 1881. Analyses of iron ores, coal, limestone, fire clays, and a few miscellaneous materials from throughout the Commonwealth are given.

MACFARLANE, JAMES, 1819-1885.

1. Die Steinkohlen der Vereinigten Staaten von Nordamerika: Gesell. Erdkunde Berlin, Zeitschr. 9, p. 241-265, 351-364, 1874. A review of the kinds of, and occurrences of, coal in the United States, includes the Commonwealth. No new details are included.
2. The coal regions of America . . .: xv, 679 p., illus., Appleton, New York, 1873; 3rd ed., xv, 697 p., 1877. A complete treatise on the origin, occurrence, and production of coal includes many details about the Commonwealth.
3. An American geological railway guide, giving the geological formation at every railway station . . .: 219 p., Appleton, New York, 1879; 2nd ed., 426 p., 1890. Reference is made to geologic formations and phenomena at railway stations along the route in the Commonwealth, as well as other states.

MacFETTERS, SAMUEL

1. Amethyst found in [Frankford] Philadelphia County: Mineral Collector 9, p. 83-84, 1902.

McGEE, W J See also Tarbert, John B., 1.

1. Map of the United States . . . areal distribution of geologic groups: U. S. Geol. Survey, Ann. Rpt. 5, p. 35-38 and pl. 2, 1885; also French edition, smaller scale. Annuaire géologique 2, app. p. 26-27, 1886.
2. Three formations of the Middle Atlantic Slope: Amer. Jour. Sci. 3rd ser. 35, p. 120-143, 328-330, 367-388, 448-466, 1888. The basal Potomac Formation

[Cretaceous and Tertiary] is found in the Commonwealth. It is described in detail and its stratigraphic position is discussed. The lower unit is sandy, the upper clayey. The upper Columbia Formation of fluvial and interfluvial origin occurs in the Susquehanna River area. It is also described in detail. Some of the terraces on the Susquehanna River are portions of this unit which formed when the land was submerged. Glacial debris overlies them. Clay deposits in the Delaware valley are part of the Columbia Formation also.

3. Reconnaissance map of the United States . . .: Scale, 1:7,000,000, U. S. Geol. Survey, 1893.

McINTOSH, FRANK K.

1. (and Mosier, McHenry). Investigation of Wood chromite mine area, Lancaster County, Pa.: U. S. Bur. Mines, Rpt. Inv. 4383, 5 p. (#), illus., 1948. Chromite occurs in serpentine which intruded into the Glenarm series. Drill holes are logged.

McKEE, J. M. See Shaw, Charles F., 1.

McKENNEY, W. F. See Tryon, F. G., 1.

MACKIN, JOSEPH HOOVER. See also Bailey, Edward Battersby, 1.

1. Terraces in the Susquehanna Valley below Harrisburg [Dauphin, Cumberland, Lancaster, and York Counties], Pennsylvania: M.A. thesis, Columbia Univ., 1932; Science ns 80, p. 140-141, 1934; Internatl. Cong. Geog. 14th, Warsaw 1934, Trans. 2, sec. 2, p. 524-528, illus., 1936. The terraces slope downstream. The breaks in the long profile are due to resistant rock rather than cyclic knickpoints due to uplift. Only two levels are recognized, the Somerville and the present. The Somerville level contains glacial pebbles, and is Pleistocene in age at least.
2. The evolution of the Hudson-Delaware-Susquehanna drainage. Amer. Jour. Sci. 5th ser. 26, p. 319-331, illus., 1933. The streams have been regionally superimposed on the Appalachian folds from the Schooley peneplain. The trellis drainage has resulted from the tributaries' working headward and seeking the softer and structurally more favorable rocks. The various other theories are reviewed.
3. The problem of the Martic overthrust and the age of the Glenarm series in southeastern Pennsylvania: Jour. Geology 43, p. 356-380, illus. incl. geol. map, 1935. Structural, stratigraphic, and geomorphic evidence is cited for the Ordovician age of the Wissahickon schist and the overlying Glenarm series. Evidence for a Precambrian age is refuted. If they are not Precambrian, the Martic overthrust does not exist.
4. The origin of Appalachian drainage—a reply: Amer. Jour. Sci. 5th ser. 36, p. 27-53, illus., 1938. This is a critical discussion of Meyerhoff and Olmsteads (1936) theory. Questions as to the force of evidence set forth in support of their postulate, problematic relations of Triassic to the present drainage, and especially the failure of their theory to explain the positions or trends of major Appalachian streams, make their theory no substitute for the Cretaceous peneplain concept.
5. Drainage changes near Wind Gap [Northampton-Monroe Counties], Pennsylvania—a study in map interpretation: Jour. Geomorphology 4, p. 24-52, illus., 1941; French resumé, p. 52-53. This is an example of a teaching technique of the scientific method using the origin of the Wind Gap as an example.

McKINSTRY, HUGH EXTON. See also Knopf, Eleanora Bliss, 4.

1. The minerals of Brinton's quarry, Chester County, Pa.: Amer. Mineralogist 1, p. 57-62, 1916. A serpentine quarry with pegmatites contains 25 minerals which are listed. The paragenesis is listed also.
2. The Poorhouse quarry, Chester County, Pa.: Amer. Mineralogist 5, p. 121-122, 1920. Chesterlite is described from the quarry. It occurs in white magnesian limestone as gash veins. Many other minerals are listed from the same locality.
3. The Unionville [Chester County], Pennsylvania, corundium mines: Amer. Mineralogist 6, p. 135-137, 1921. Corundum occurs in pegmatites which have intruded serpentine and other basic rocks in the area. Feldspar, beryl and tourmaline are associated. Structural relations are unclear.
4. Mineral isograds in southeastern Pennsylvania: Amer. Mineralogist 34, p. 874-892, illus. incl. geol. maps, 1949. Metamorphic isograds are recognized in

the Glenarm series. Chlorite, biotite, garnet, staurolite, kyanite, and sillimanite zones occur in argillaceous rocks, and in that order toward the source. The zones are crowded and show local overlap. Tremolite and pyroxene are in the associated carbonate rocks.

McLAUGHLIN, DEAN BENJAMIN. See also Willard, Bradford, 65.

1. The thickness of the Newark series in Pennsylvania and the age of the border conglomerate: Mich. Acad. Sci., Papers 16, p. 421-427, illus., 1932. The Newark series in southeastern Pennsylvania is at least 20,000 feet thick, even considering duplication by faulting. The border conglomerate is interbedded with the Brunswick Formation and is at least as young.
2. A note on the stratigraphy of the Brunswick formation (Newark) in [Bucks-Montgomery Counties] Pennsylvania: Mich. Acad. Sci., Papers 18, p. 421-435, illus., 1933. Layers of black argillite in the red Brunswick Formation can be traced for long distances. The lower Brunswick can be divided into: (1) the Graters member above and (2) the Saratoga member below. Measured sections are given.
3. A great alluvial fan in the Triassic of [Berks County] Pennsylvania: Mich. Acad. Sci., Papers 24, Part 4, p. 59-74, illus. incl. geol. maps, 1939. A conglomerate formation occupies the entire Triassic column and intertongues eastward into the Stockton and Brunswick Formations and westward into the New Oxford and Gettysburg Formations. It is called the Robeson conglomerate and is considered to be an alluvial fan. Sections are measured.
4. The distribution of minor faults in the Triassic of [southeastern] Pennsylvania: Mich. Acad. Sci., Papers 27, p. 465-479, illus. incl. geol. map, 1942. Minor faults in the Triassic are closely related to the few major faults and to the North Border fault. Their effect upon the thickness of the total Triassic is negligible.
5. The Revere [Bucks County] well and Triassic stratigraphy: Pa. Acad. Sci., Proc. 17, p. 104-110, illus. incl. geol. map, 1943. The water well, logged by Lesley in 1891, is compared with nearby surface outcrops. The well sequence can be explained without extensive faulting. The well is in the Brunswick Formation with tongues of Lockatong-type shale interbedded.
6. Triassic stratigraphy in the Point Pleasant [Bucks County] district, Pennsylvania: Pa. Acad. Sci., Proc. 18, p. 62-69, illus. incl. geol. maps, 1944. Details of the Lockatong-Brunswick Formation intertonguing are described. Sections are measured.
7. Type sections of the Stockton and Lockatong formations [Bucks County]: Pa. Acad. Sci., Proc. 19, p. 102-113, illus. incl. geol. map, 1945. The Stockton and lower Lockatong Formations are measured in detail near the Delaware River and in New Jersey. Some faulting is recorded. Diabase is present. The total thickness is 12,000 feet.
8. The Triassic rocks of the Hunterdon Plateau, New Jersey [and Bucks County, Pa.]: Pa. Acad. Sci., Proc. 20, p. 89-98, illus., 1946. A complete description of the Triassic rocks is given. Interbedded Lockatong and Brunswick Formations are discussed. Measured sections are given.
9. Continuity of strata in the Newark series [Bucks-Montgomery Counties]: Mich. Acad. Sci., Papers 1946, 32, p. 295-303, illus. incl. geol. maps, 1948. Gray and red shales are interbedded at the Lockatong-Brunswick Formation contact. The thin layers can be traced for many miles, suggesting broad, quiet lakes which were always shallow.
10. (and Willard, Bradford). Triassic facies in the Delaware Valley [Bucks County]: Pa. Acad. Sci., Proc. 23, p. 34-44, illus. incl. geol. map, 1949. The Lockatong shale grades eastward and westward into the Brunswick Formation. The Lockatong Formation thus is a lacustrine facies of the Brunswick Formation.

MACLURE, WILLIAM. See also Cist, Zachariah, 2.

1. Observations on the geology of the United States of North America . . .: 127 p., illus. incl. geol. map, A. Small, Philadelphia, 1817; Amer. Phil. Soc., Trans. ns 1, p. 1-91, illus, incl. geol. maps, 1818; Zeitschrift fur Mineralogie (ed., Leonhard) 1, 1826, p. 124-138, Frankfurt-Am-Main, 1826. A very generalized discussion of geological principles includes examples from the Commonwealth. A colored map of the [eastern] United States is included.

McNAIR, ANDREW HAMILTON

1. Upper Devonian Bryozoa [Northern Pa.] [abs.]: Geol. Soc. Amer., Proc. 1937, p. 99-100, 1938.

MAJORELLE, JEAN

1. Les champs de pétrole de l'est des Etats-Unis: Revue de l'Industrie Minérale 55, p. 177-196, illus., Paris, 1923. A brief review of the Devonian-Pennsylvanian stratigraphy of the western counties is followed by an even briefer discussion of the petroleum-bearing sands and the structures. No details are included.

MANGAN, JOHN W.

1. Pennsylvania springs and their volume of flow: Pa. Dept. Internal Affairs, Monthly Bull. 13, no. 5, p. 26-27, 1945. A table of the 36 largest springs in the Commonwealth is given. The two largest ones are in Cumberland County.

MANNERS, JOHN

1. (and Mitchell, Thomas D.). Analysis of a mineral spring, at the Willow Grove, Montgomery County, Pennsylvania: Columbian Chemical Soc. Phila., Mem. 1, p. 93-95, 1813.

MANSFIELD, GEORGE R.

1. (and Boardman, Leona). Nitrate deposits of the United States: U. S. Geol. Survey, Bull. 838, vi, 107 p., illus., 1932. Sandstone with thin incrustations of potassium nitrate is reported from Chestnut Ridge, near Greensburg, Westmoreland County.

MANSFIELD, IRA F.

1. [*Eurypterus* from Darlington shale, Beaver County]: Amer. Phil. Soc., Proc. 19, p. 351-352, illus., 1881. A life-size illustration, with no explanatory text is given.
2. Eurypterid collection [in Pennsylvania Geological Survey museum], *in* Catalogue of the geological museum, Part 3: Pa. Geol. Survey 2nd, 000, p. 98, 1889. A list of the eurypterids illustrating report PPP of the Survey. All are from the shale under the Darlington coal bed, Beaver County. No names are given.
3. (and others). Fire clay, coals, and titles of the cannel coal tract at Cannelton, Beaver County, Pa.: 40 p., illus. incl. geol. maps, Tribune Printing Co., Beaver Falls, Pa., 1905. A prospectus describing the [Pennsylvanian] rocks of the area. A description of the fire clays, cannel coal, limestone, oil, and sandstone are also included. *Eurypterus mansfieldi* is illustrated from this famous fossil locality.

MARCOU, JOHN BELKNAP. See Marcou, Jules, 5.

MARCOU, JULES, 1824-1898.

1. Geological map of the United States and the British provinces of North America: Scale, 1 inch equals 100 miles, text accompanies, 92 p., illus., Boston, 1853; discussion by J. D. Dana: Amer. Jour. Sci. 2nd ser. 17, p. 199-200, 1854; also French edition, 124 p., illus., Paris, 1854. A colored map includes the Commonwealth in generalized form, along with a cursory description of the rock.
2. Esquisse d'une classification des chaines de montagnes d'une partie de l'Amerique du Nord: Acad. Sci. Paris, C. R. 39, p. 1192-1197, illus. incl. geol. map, 1854; Annales des Mines, Mem. 5th ser. 7, p. 329-350, illus. incl. geol. map, Paris, 1855; Mining Mag. 7, p. 321-333, illus. incl. geol. map, New York, 1856. A discussion of the mountain building periods of the United States includes the Commonwealth. A colored map accompanies the discussion.
3. Le terrain carbonifère dans l'Amérique du Nord: Archives des sciences physiques et naturelles 29, p. 95-117, Geneva, 1855. This is a review of the [Mississippian] and [Pennsylvanian] stratigraphy of the Commonwealth and elsewhere. No new details are included.
4. Geology of North America . . .: 144 p., illus. incl. geol. map [by W. Maclure], Zurich, 1858; review [discussion] by J. D. Dana: Amer. Jour. Sci. 2nd ser. 26, p. 323-326, 1858; discussion by L. Agassiz, 2nd ser. 27, p. 134-137, 1859; reply by J. D. Dana, p. 137-140; reply by author with title, Reply to the criticisms of James D. Dana: 40 p., Zurcher and Furrer, Zurich, 1859. A cursory description of the United States includes the Commonwealth. The discussions are not directly associated with Pennsylvania, but are fascinating.
5. (and Marcou, John Belknap). A catalogue of geological maps of America north and south) 1752-1881: U.S. Geol. Survey, Bull. 11, 184 p., 1885. A list

of all the maps published about the United States includes the Commonwealth, with bibliographic references.

MARR, J. E.

1. Obituary, Charles Doolittle Walcott, LL.D., Sc.D., Ph.D. [1850-1927]: Geological Mag. 64, p. 189-190, London, 1927.

MARSH, OTHNIEL CHARLES, 1831-1889.

1. Amphibian footprints from the Devonian [Warren County]: Amer. Jour. Sci. 4th ser. 2, p. 374-375, illus., 1896. *Thinopus antiquus* is illustrated and described from near the top of the Chemung Formation.

MARSHALL, CHARLES EDMUND

1. Contribution to the comparative petrology of British and American coals of Carboniferous age—Anthraxylon and vitrinite (vitrain): Fuel 20, p. 52-59, 82-91, illus., London, 1941. Petrographic examination and comparison of coal includes many examples from the Commonwealth. Vitrain and anthraxylon are possibly synonymous.
2. The constitution of anthraxylon (vitrain or vitrinite), and its relation to type and rank variation in coal seams: Fuel 22, p. 140-155, illus., London, 1943. A petrographic study of coal includes examples from the Commonwealth.

MARTENS, JAMES HART CURRY

1. Petrography and correlations of deep-well sections in West Virginia and adjacent states. W. Va. Geol. Survey, [Rpt.] 11, xiv, 255 p., illus., 1939. Ordovician-Pennsylvanian rocks are described from well logs, some of which are from the Commonwealth. Some correlations are included.
2. Well-sample records: W. Va. Geol. Survey. [Rpt.] 17, xiii, 899 p., 1945. Included are well records from many wells in the Commonwealth. They include rocks from Ordovician to Pennsylvanian in age.

MARTIN, DANIEL STROBEL

1. On the rocks of New York Island and their relation to the geology of the middle states [abs.]: Liverpool Geol. Soc., Proc. 3, p. 118-120, 1876.
2. The "field of rocks" [Delaware County]: New York Acad. Sci., Trans. 1887-88, 7, p. 16-18, 1887. A boulder field near Bryn Mawr is composed of large rounded gneiss blocks. No similar rocks are found nearby. No explanation is offered, although glaciation is discounted.

MARTIN, GEORGE CURTIS. See also Stose, George Willis, 5.

1. Water resources of the Accident and Grantsville quadrangles, Maryland [and Somerset-Fayette Counties, Pa.]: U. S. Geol. Survey, Water-Supply Paper 110, p. 168-170, 1905. The Greenbrier limestone is a source of many springs, and the Pennsylvanian sandstones always yield ground water.
2. Water resources of the Frostburg and Flintstone quadrangles, Maryland and West Virginia [and Bedford-Somerset Counties, Pa.]: U.S. Geol. Survey, Water-Supply Paper 110, p. 171-173, 1905. The Greenbrier and Helderberg limestone outcrops are a source of spring water, as is the Oriskany-Helderberg contact. The Mississippian sandstones yield a good supply of ground water.
3. Description of the Accident and Grantsville quadrangles, Md. [Fayette-Somerset Counties] Pa.-W. Va.: U. S. Geol. Survey, Geol. Atlas of U. S. folio 160, 14 p., illus. incl. geol. maps, 1908. A small portion of this completely described area lies in the Commonwealth. Devonian-Pennsylvanian rocks are mapped. Folds characterize the area. Sections are measured. Coal is the chief mineral resource; clay, shale, stone, and iron ore are also mentioned.

MARTIN, LAWRENCE. See Phalen, William Clifton, 1, 4.

MASON, JOHN W.

1. Two old Appalachian copper mines [Chester County]: Engineering and Mining Jour. 99, p. 746, illus., 1915. A brief resumé of the copper deposits of the Perkiomen mine is given.

MASON, WILLIAM D. H.

1. On the batrachian foot tracks from the Ellengowan shaft, in Schuylkill Co., Pa.: Amer. Phil. Soc., Proc. 17, p. 716-719, 725, 1878. Three-toed tracks are described from the shale over the Mammoth coal seam. A discussion of their relation to the early reptiles is included.

MATHER, KIRTLEY F.

1. Memorial of Thomas Clachar Brown [1882-1934]: Geol. Soc. Amer., Proc. 1934, p. 203-208, port., 1935.

MATHEWS, ALFRED. See Ashburner, Charles Albert, 24.

MATHEWS, EDWARD BENNETT

1. Correlation of Maryland and [York County] Pennsylvania Piedmont formations: Geol. Soc. Amer., Bull. 16, p. 329-346, illus., 1905. The Baltimore gneiss occurs as the basement rock. The Cambrian Setters quartzite and Cockeysville marble are absent in York County. The Ordovician Wissahickon schist lies on the gneiss. This is overlain by Cardiff quartzite and Peach Bottom slate. Correlations are made between the two states.
2. Submerged "deeps" in the Susquehanna River [Lancaster County]: Geol. Soc. Amer., Bull. 28, p. 335-346, illus., 1917. Deep areas in the river floor parallel to the main channel are due to local stratigraphic variations in the rocks or an increased volume of water, or both. Increased velocity due to decreased cross section would also account for them. The age is post-Talbot terrace and probably in part Recent.

MATTESON, LAWRENCE STANLEY. See also Cathcart, Stanley Holman, 13; Dickey, Parke Atherton, 4, 5; Sherrill, Richard Ellis, 4, 5, 7.

1. (and Busch, Daniel Adolph). Oil-bearing sands in southwestern Pennsylvania: Pa. Geol. Survey 4th ser., Special Bull. 1, iv, 16 p., illus., 1944. Pennsylvanian-Devonian oil-bearing sands are described. Well records are included. Cross sections of correlations are shown. The various sands are shown on isopach maps of the various quadrangles.

MATTHEW, GEORGE FREDERICK

1. Abraham Gesner [1797-1864]—a review of his life and work: Nat. Hist. Soc. New Brunswick, Bull. 15, p. 3-48, illus., St. Johns, 1897.

MATTIMORE, H. S.

1. Investigation of available road-building materials in Pennsylvania [abs.]: Pa. Acad. Sci., Proc. 1, p. 56-57, 1926.

MAXWELL, VOLNEY L.

1. Mineral coal: Wyoming Hist. Geol. Soc., Pub. no. 1, 53 p., 1858. A popular account of the origin of coal and of the geology around Wyoming County is given.

MEADE, WILLIAM

1. Remarks on the anthracite of Europe and America: Amer. Jour. Sci. 12, p. 75-83, 1827. The coal from the Commonwealth is a true anthracite and is much higher in quality than that of England. Emphasis is on the Rhode Island coal, however.
2. A chemical analysis of the Pittsburgh [Allegheny County] mineral spring: Amer. Jour. Sci. 14, p. 124-135, 1828. A spring is described and analyzed. Carbon dioxide is common, as are iron salts. There are also magnesium, sodium, and calcium present.
3. Chemical analysis and description of the coal lately discovered near Tioga River in the state of Pennsylvania: Amer. Jour. Sci. 13, p. 32-35, 1828. A simple proximate analysis is made of a "good grade" bituminous coal. Its stratigraphic position is not ascertained. Coal in the county is described as "extensive."

MEASE, JAMES

1. A geological account of the United States . . .: 510 p., Birch and Small, Philadelphia, 1807. The physiography of the Commonwealth is discussed, as is the general areal geology. Included also are mentions of minerals of all sorts, including coal and iron. Springs are also mentioned. Some fossils are listed.

MEEKER, GEORGE H.

1. Biographical memoir of Edgar Fohs Smith, 1854-1928: Natl. Acad. Sci., Biog Mem. 17, p. 103-149, port., 1937.

MEIER, ADOLPH E. See also Tomlinson, W. Harold, 1.

1. (and Tomlinson, W. Harold). Harmotome from Delaware County, Pennsylvania, a barium zeolite of hydrothermal origin: M.A. thesis, Bryn Mawr College, 1937; [abs.] Amer. Mineralogist 22, no. 12, part 2, p. [9], 1937; 23, p. 174, 1938.
2. (and Tomlinson, W. Harold). An association of harmotome, corundum, and hyalophane at Glen Riddle [Delaware County], Pa.: M.A. thesis, Bryn Mawr College, [1937]; [abs.]. Amer. Mineralogist 24, p. 189, 1939.

3. Association of harmotome and barium feldspars at Glen Riddle [Delaware County], Pa.: M.A. thesis, Bryn Mawr College, [1938]; Amer. Mineralogist 24, p. 540-560, illus., 1939. Harmotome crystals are found on joints in anorthositic gabbro dikes containing hyalophane-plagioclase antiperthites. The harmotome results from partially resorbed hyalophane by late soda-rich solutions which redeposited the material in joints.
4. Association of pyroxene granite and serpentine near Lima [Delaware County], Pennsylvania: M.A. thesis, Bryn Mawr College, 1939; [abs.] Geol. Soc. Amer., Bull. 51, p. 2002-2003, 1940.
5. Descent of plagioclase-rich corundum bearing pegmatites from desilicated granite at Glen Riddle [Delaware County], Pa.: M.A. thesis, Bryn Mawr College, [1939?]; [abs.], Amer. Mineralogist 25, p. 210, 1940.

MEINZER, OSCAR EDWARD

1. Large springs in the United States: U. S. Geol. Survey, Water-Supply Paper 557, vii, 94 p., illus., 1927. Springs with a discharge of 30 second-feet are described, including some from the Commonwealth. They are only briefly mentioned, with no data, other than discharge given.

MENDENHALL, WALTER CURRAN

1. [Charles] David White [1862-1935]: Science ns 81, p. 244-246, 1935.
2. [Charles] David White [1862-1935]—an appreciation: Scientific Monthly 40, p. 380-382, port., 1935.
3. (and Postley, Olive Clara). Memorial of [Charles] David White [1862-1935]: Geol. Soc. Amer., Proc. 1936, p. 271-291, port., 1937.

MERCER, HENRY CHAPMAN

1. Re-exploration of Hartman's Cave, near Stroudsburg [Monroe County], Pa., in 1893: Acad. Nat. Sci. Phila., Proc. [46] 1894, p. 96-104, illus., 1894. Human and animal remains are in the cave. They are atop a finely laminated clay layer which is attributed to glacial ponding. Pre-glacial scouring probably removed the pre-glacial fossils.
2. . . . re-exploration in 1894 and 1895 of the "Bone Hole", now known as Irwin's Cave, at Port Kennedy, Montgomery Co., Pa.: Acad. Nat. Sci. Phila., Proc. [47] 1895, p. 443-446, 1896. Quarrying has made the cave more accessible. A large mixture of bones is present. By and large it is related to glacial times, with water being the agent that brought the bones into the cave.
3. The bone cave at Port Kennedy [Montgomery County], Pennsylvania and its partial excavation in 1894, 1895, and 1896: Acad. Nat. Sci. Phila., Jour. 2nd ser. 11, p. 269-285, illus., 1899. A very detailed description of the Ordovician limestone cave and its filling material is given. The nature, composition, and condition of the vertebrate remains are considered. The bones are Pleistocene in age.

MEREDITH, THOMAS

1. . . . Belmont anthracite mines in [Susquehanna County] Pennsylvania: Amer. Jour. Sci. 12, p. 301-302, 1827. The area is described physically and stratigraphically. Iron ore in nodules is reported from the clay above the coal.

MERRIAM, JOHN C.

1. Doctor [Charles Doolittle] Walcott [1850-1927] . . .: Smithsonian Misc. Collections 80, no. 12, p. 5-9, port., 1928

MERRILL, GEORGE PERKINS, 1854-1929. See also Hadley, Arthur Twining, 2; Troost, Gerard, 1.

1. Note on a Potsdam sandstone, or conglomerate, from Berks Co., Pa.: U. S. Natl. Museum, Proc. 5, p. 660-661, 1883. A piece of [Hardyston] quartzite is described petrographically. No geographic or stratigraphic information is included. Hematite scales are disseminated throughout, giving to it a red color.
2. Building and ornamental stones of the United States: Popular Science Monthly 27, p. 520-532, 1885. A popular account of the geographic origin of many of our popular building stones is given. The Commonwealth is included. No geological details are included.
3. Among the Pennsylvania slate quarries: Scientific American, Supplement 27, p. 10874-10875, illus., 1889. A popular account of the origin, composition, and use of slate from the Commonwealth is given.
4. Notes on the serpentinous rocks . . . from near Easton [Northampton County], Pa.: U. S. Natl. Museum, Proc. 12, p. 595-600, 1890. A description and an

analysis are given of a rock from a quarry on Chestnut Hill. The main mass is a dull greenish mixture, whereas pure compact serpentine occurs in veins associated with calcite.

5. Stones for building and decoration: ix, 453 p., illus., Wiley, New York, 1891; 2nd ed., ix, 506 p., illus., 1897; 3rd ed., xi, 551 p., illus., 1908. Stone from the Commonwealth is discussed along with many other states.
6. A newly found iron meteorite from Somerset County, Pennsylvania: Amer. Jour. Sci. 5th ser. 5, p. 175-176, 1923. A 40-pound meteorite is described and analyzed. It is not related to the Mt. Joy (Adams County) meteorite as was suspected.

MERRIMAN, MANSFIELD

1. The slate regions of Pennsylvania: Stone 17, p. 77-90, illus., 1898. A review of the origin and occurrence of slate in Lehigh, Northampton, and Lancaster Counties is given. The physical features of individual deposits are described.

MERWIN, H. E. See Posnjak, Eugen, 1.

MEYER, ABRAHAM

1. On the drift of Lycoming Co., Pa.: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 50, 1882; Mineralogy and Geol. Sec., Proc. no. 2, p. 17, 1882. Drift ridges occur along Lycoming Creek and Hogelans Run. Pebbles of granite and gneiss with magnetite are reported from several places in Lycoming and Tioga Counties. No details are given.
2. On the fossil ores of Lycoming Co., Pa.: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 52, 1882; Mineralogy and Geol. Sec., Proc. no. 2, p. 19, 1882. The Clinton ores in the county have an average thickness of two feet. The horizontal beds are oolitic; the inclined ones are slickensided. They yield 40 percent metallic iron. Some nodules have an iron carbonate nucleus.
3. Notes on the presence of Umbral or Mountain limestone in Lycoming County, Pennsylvania. Acad. Nat. Sci. Phila., Proc. [41] 1889, p. 310-311, 1890. A limestone unit in the center of the [Mauch Chunk] is described from an outcrop in the county. It had not been previously mapped.
4. Notes on the occurrence of quartz and other minerals in the Chemung measures, near the line of Lycoming and Tioga Counties, Pa.: Acad. Nat. Sci. Phila., Proc. [45] 1893, p. 194-196, 1893. Quartz crystals and a variety of other types are described. They are thought to be hydrothermal in origin.
5. Pyrophyllite slates in northern Pennsylvania: Acad. Nat. Sci. Phila., Proc. [45] 1893, p. 197-200, 1893. Slate with secondary quartz fragments is described from the Chemung and Catskill Formations in Tioga and Lycoming Counties. It is not considered economic because of the quartz.

MEYERHOFF, HOWARD AUGUSTUS

1. (and Olmstead, Elizabeth Warren). Triassic influences on Appalachian drainage [abs.]: Geol. Soc. Amer., Bull. 44, p. 94-95, 1933.
2. (and Olmstead, Elizabeth Warren). Wind gaps and water gaps in Pennsylvania: Amer. Jour. Sci. 5th ser. 27, p. 410-416, illus., 1934; discussion with title, Wind gaps and water gaps—their value as indicators of erosion surfaces, by K. Ver Steeg, 5th ser. 30, p. 98-105, illus., 1935; reply by authors with title, Wind-gap and water-gap systems in Pennsylvania, 5th ser. 31, p. 391-393, 1936. The Appalachian region of the Commonwealth contains the record of several erosional levels of fluvial origin. The positions of these levels are indicated with moderate accuracy by groups of water gaps and wind gaps. Isolated wind gaps may have no cyclical significance, but groups are reasonably reliable indicators. Ver Steeg disagrees.
3. (and Olmstead, Elizabeth Warren). Structural determinants in Appalachian drainage [abs.]: Geol. Soc. Amer., Proc. 1935, p. 92-93, 1936.
4. (and Olmstead, Elizabeth Warren). The origin of Appalachian drainage: Amer. Jour. Sci. 5th ser. 32, p. 21-42, illus., 1936. The present drainage of the Appalachians was established in Permo-Triassic time. Sketches are presented to show how the present water gaps and ridges could have come about without an uplifted peneplain being necessary. The directions and locations of streams were determined by the topography created by the Appalachian Revolution.
5. (and Olmstead, Elizabeth Warren). Tertiary marine planation in the Piedmont and southern New England [abs.]: Geol. Soc. Amer., Bull. 49, p. 1954-1955, 1938.

6. (and Olmstead, Elizabeth Warren). Structural determinants in Appalachian drainage [abs.]: Geol. Soc. Amer., Bull. 57, p. 1270, 1946.
7. (and Moss, John Hall, and Foose, Richard Martin). Appalachian drainage and Pleistocene terraces [Lancaster-Dauphin Counties]: Field Conf. of Pa. Geologists, 15th, 4 p. (#), illus., Lancaster, 1949. This is an itinerary for a field trip along the Susquehanna River in Lancaster and Dauphin Counties. The gravel terraces are especially considered.

MEYERS, THURMAN H. See Cathcart, Stanley Holman, 6.

MIERS, HENRY A.

1. Obituary—Samuel Lewis Penfield [1856-1906]: Mineralogical Mag. 14, p. 264-268, port., London, 1907.

MILLER, ARTHUR KEITH. See also Willard, Bradford, 39.

1. (and Flower, Rousseau Hayner). A *Sporadoceras* from [Erie County] America: Jour. Geology 44, p. 751-757, illus., 1936. *Sporadoceras milleri* is described from the Panama conglomerate in the Conewango group. This is its first appearance in North America.
2. Cephalopods of the Tully formation in central Pennsylvania, *in* Tully limestone and fauna in Pennsylvania, by B. Willard: Geol. Soc. Amer., Bull. 48, p. 1253-1255, illus., 1937. Three ammonoid genera and one nautiloid genus are described from various localities in the Commonwealth.
3. Devonian ammonoids of North America: Geol. Soc. Amer., Special Paper 14, 262 p., illus., 1938; discussion with title, Devonian ammonoids of North America and their migration routes, by C. Schuchert: Amer. Jour. Sci. 5th ser. 36, p. 453-455, 1938; reply by author, p. 455. A description of the ammonoids includes only a few from the Commonwealth. Schuchert discusses the Commonwealth only by implication.
4. (and Collins, Leigh R.). *Endolobus* from the Greenbrier limestone of [Fayette County] Pennsylvania: Jour. Paleontology 21, p. 239-241, illus., 1947. *Endolobus greenbrierensis* is described. Other fossils are present and the age is verified as Chesterian.
5. (and Unklesbay, Athel Clyde). The cephalopod fauna of the Conemaugh series in western Pennsylvania, supplement: Carnegie Museum, Annals 30, p. 319-330, illus., 1947. Eight genera and nine species of cephalopods, mostly nautiloids, from many different localities are described and illustrated.

MILLER, BENJAMIN LEROY, 1874-1944. See also Bascom, Florence, 9, 10, 13; Behre, Charles Henry, 10; Jonas, Anna Isabel, 14; Stose, George Willis, 36; Watson, Edward Hahn, 2.

1. Paint shales of Pennsylvania: U. S. Geol. Survey, Bull. 470, p. 485-496, 1911. Black, yellow, and red-colored shales from various parts of the Commonwealth are described. Individual deposits are described. No detail is included.
2. The mineral pigments of Pennsylvania: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 4, 101 p., illus., 1911. Ochre, umber, sienna, iron carbonate, black shale, yellow shale, red shale, hematite, limonite, and some minor substances are present in the Commonwealth and are being mined as paint ore. Each is discussed geologically in the various areas where it is found. Analyses are made.
3. Graphite deposits of [southeastern] Pennsylvania: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 6, 147 p., illus., 1912. Graphite is limited to the metamorphosed Precambrian rocks in southeastern Pennsylvania, Chester County being the biggest source. It occurs as regularly distributed flakes in the marble, and (1) as disseminations, (2) in pegmatites, and (3) in small veins; all are in the Pickering gneiss. Its origin is metamorphic. Individual workings are described.
4. The geology of the graphite deposits of [southeastern] Pennsylvania: Economic Geology 7, p. 762-777, 1912. Graphite occurs in ten counties in southeastern Pennsylvania. It occurs in sandstone, gabbro, limonite, basic gneisses, limestone, and acid gneisses. The last is the best source. The graphite is described. It has an organic origin.
5. The graphite industry of Pennsylvania: Mining and Engineering World 38, p. 625-628, illus., 1913. An extremely brief review of the graphite-bearing schist of the southeast, with much emphasis on production techniques, is given.
6. (and Wherry, Edgar Theodore). Geology, *in* Anniversary History of Lehigh County 1, by Charles Rhodes Roberts (and others): p. 1-14, Allentown, 1914.

A brief review of the stratigraphy and mineral resources is given. No details are included.

7. Manganese occurrences in eastern Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 47, 11 p. (#), 1922. Manganese is associated with ground-water-precipitated limonite in Lehigh and York Counties. Manganese is also found as a constituent of the magnetite ores in Berks County. Psilomelane occurs in masses in arkosic Triassic sandtone in Berks County, and a few other brief references are made to other eastern counties.
8. Lead and zinc ore in Blair County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 65, 4 p. (#), 1923. Lead and zinc minerals have been deposited in cracks of shattered limestone and dolomite. The source is not discussed.
9. Lead and zinc ores in Bucks County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 69, 4 p. (#), 1923. Lead and zinc minerals are known from the Triassic rocks in the New Galena area. The origin is considered.
10. Lead and zinc ores in Lancaster County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 68, 3 p. (#), 1923. Lead is known from the Pequea mine. The ore is argentiferous galena. From the Bamford mine come many varieties of lead and zinc minerals. None are extensive.
11. Lead and zinc ores near Phoenixville, Chester County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 67, 12 p. (#), illus., 1923. A generalized description of the mines and occurrences is given. A variety of minerals are discussed. The ores are hydrothermal and occur in veins. A map of the mines and mineral locations is presented.
12. Zinc ores at Friedensville, Lehigh County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 70, 7 p. (#), 1923. A generalized description of zinc minerals in Ordovician Beekmantown limestone is given. The ore was deposited in veins by ground water from dissolved clastic fragments.
13. Lead and zinc ores of Pennsylvania: Pa. Geol. Survey 4th ser., M 5, 91 p., illus., 1924. Each of the counties in which lead or zinc is known is considered. Lead and zinc are widespread in the Commonwealth, but occur as economic deposits primarily in the southeastern part. Maps and discussions of individual deposits are given.
14. Allentown quadrangle [Bucks, Lehigh, and Northampton Counties]—mineral resources: Pa. Geol. Survey 4th ser., Topog. Geol. Atlas 206, 195 p., illus. incl. geol. map, [1925]. A complete geologic description of the area is given. Precambrian-Ordovician, Triassic and Pleistocene rocks are present. Sections are measured. Iron, zinc, and cement are the major resources. Other minor products are also described.
15. Limestones of Pennsylvania: Pa. Geol. Survey 4th ser., M 7, 368 p., illus., 1925. This is a detailed description of limestones by age and by geographic location. Sections are measured; analyses are made.
16. An unusual case of limestone decomposition [Berks County] [abs.]: Pa. Acad. Sci., Proc. 1, p. 77-78, 1926. A limestone is weathering to fine pulverulent powder. Local areas are affected, and no explanation seems acceptable.
17. Taconic folding in Pennsylvania: Geol. Soc. Amer., Bull. 37, p. 497-508, 1926; discussions, p. 509-511. Evidence for post-Ordovician, pre-Silurian folding is analyzed. Definite unconformities occur at Lehigh and Schuylkill Gaps. Martinsburg pebbles are in the Lower Silurian rocks. In some places the upper Martinsburg rocks are missing. Ordovician shale is more metamorphosed than Devonian shale nearby. The Ordovician-Silurian boundary is discussed.
18. The origin and utilization of the Cambro-Ordovician limestones of Pennsylvania: Pa. Acad. Sci., Proc. 1, p. 89-99, illus., 1926. The Middle and Upper Cambrian and Lower and Middle Ordovician rocks of Pennsylvania are predominantly limestone and dolomite. The historical geology is outlined. Their use as building stone, road metal, agricultural lime, and as high-grade chemical ore is discussed.
19. The Lehigh portland-cement district [Berks, Lehigh, and Northampton Counties], Pennsylvania, *in* Mineral deposits of New Jersey and eastern Pennsylvania, by C. P. Berkey: Internatl. Geol. Cong., 16th, U.S. 1933, Guidebook 8, Excursion A-8, p. 30-40, illus., 1932. A generalized description of the cement limestone area is given. The Jacksonburg limestone is the major

source rock. Its distribution, lithology, composition, age, and structure are discussed. Analyses are given.

20. Limestones of Pennsylvania: Pa. Geol. Survey 4th ser., M-20, 729 p., illus., 1934. A complete, detailed discussion of the limestones and limestone resources of the Commonwealth is given. Each county is discussed separately. Analyses are made.
21. Memorial of Edward Higginson Williams, Jr. [1849-1933]: Geol. Soc., Amer., Proc. 1933, p. 289-297, port., 1934.
22. Age of the schists of the South Valley Hills [Lancaster, Chester, and Philadelphia Counties] Pennsylvania: Geol. Soc. Amer., Bull. 46, p. 715-756, illus., 1935; discussion by author, G. W. Stose, A. I. Jonas, and W. H. Bucher, p. 2021-2031; abstract with discussion; Proc. 1934, p. 95-98, 1935. A review of the controversy about the age of the Glenarm series is given. A history of the problem is also included. The evidence for both views (Precambrian or Ordovician) is listed and discussed. No conclusions are drawn, however. The Martic overthrust problem is included.
23. (and others). Lower Paleozoic formations and their relations to the pre-Cambrian rocks, trip D *of*, Geology of the Philadelphia area, by E. Watson: Field Conf. of Pa. Geologists, 5th, p. 35-43, illus., [n. p.], [1935]. This is a detailed mimeographed road itinerary of places where the Paleozoic rocks are near the Precambrian rocks. A Cretaceous clay pit is also visited.
24. Unsolved problems of eastern Pennsylvania geology: Pan-Amer. Geologist 63, p. 161-172, 1935. A review of the major problems of the Commonwealth is given. The major categories of stratigraphy, physiography, structure, and economic geology are considered separately.
25. (and others). Geological inspection of anthracite field [Luzerne-Lackawanna Counties]: Field Conf. of Pa. Geologists, 6th, 11 p. (#), illus., [n. p.], 1936. This is a mimeographed road itinerary with accompanying cross sections of the anthracite areas. No details are given.
26. Casts of halite crystals in the Beekmantown limestone [Lehigh County]: Pa. Acad. Sci., Proc. 11, p. 55-57, illus., 1937. Halite crystals associated with many shallow-water features suggest shallow, salt-marsh-like conditions in Ordovician time.
27. Breathing caverns of the Lehigh Valley [Lehigh County]: Pa. Acad. Sci., Proc. 12, p. 105-107, 1938. Cavities in limestone exude cold air. There appears to be an intricate network underground, although no caverns are evident. Ice caverns are a possibility, but more work is needed.
28. Economic geology, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 311-408, illus., 1939. Metallic and non-metallic resources are described. Iron, paint pigment, cement, limestone, building stone, soapstone, sand and gravel, clay, abrasives, and peat are discussed.
29. Geologic history, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 464-472, 1939. A brief resumé of the history of the county is given. It includes Precambrian to Quaternary time.
30. (and Warmkessel, Carl A.). Ground water resources, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 409-428, 1939. Each area and formation is considered as a potential source of water. Blue Mt., Martinsburg slate, limestone, sandstone, and gneiss are considered as areas. Well records are given.
31. Guidebook to places of geologic interest in the Lehigh Valley, Pa.: Pa. Geol. Survey 4th ser., G 16, 47 p., illus., 1939. The detailed itineraries of several trips are given. Precambrian-Silurian, Triassic and Pleistocene rocks are described. Fossils are listed. The trips are from Bethlehem to Coopersburg, Bethlehem to Center Valley, Bethlehem to Delaware Water Gap, Bethlehem to Little Gap, Easton to Upper Black Eddy, Easton to Belvedere, N. J., Allentown to Center Valley, and Allentown to Treichlers.
32. (and Myers, Philip B.). Hardyston formation, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 206-223, illus., 1939. A complete discussion of this Cambrian sandstone is given. Conglomerate, quartzite, and sandstone with jasper cement are present. Limonitic shale and pinite are also described. Fossils are rare; the thickness varies.

33. (and Behre, Charles Henry, Jr.). Martinsburg formation, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 263-270, 1939. A complete description of the formation in the county is given. Three lithic units can be observed; they are a lower banded clay slate, a middle sandy member, and an upper banded clay slate. Fossils are listed; sections are measured. The thickness is uncertain.
34. Mineralogy, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 435-463, 1939. Fifty-one different minerals are described and collection locations are given.
35. (and others). Northampton County, Pa.: Pa. Geol. Survey 4th ser., C-48, x, 496 p., illus. incl. geol. map, 1939. This contains many separately authored chapters which are cited individually. It is a thorough geological discussion of the county. Stratigraphy, structure, economic geology, ground water, etc., are considered. Iron, cement, slate, limestone, and other items are the most important economic products.
36. Physiography, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 115-144, illus., 1939. The county has been widely studied for the features present. The Folded Appalachians, Great Valley, Reading Prong, and Triassic Lowlands are present. The origins of local features are discussed. Peneplains are well developed as are the wind and water gaps.
37. Rock ("desert") varnish in [Lehigh County] eastern Pennsylvania: Pa. Acad. Sci., Proc. 13, p. 98-101 illus., 1939. Manganese- and limonite-coatings are found on boulders of Hardyston quartzite from the area. These coatings are not formed in desert areas alone, so the term "rock varnish" is proposed instead of desert varnish.
38. *Scolithus* tubes in Hardyston sandstone [Northampton-Lehigh Counties]: Pa. Acad. Sci., Proc. 13, p. 101-104, illus., 1939. *Scolithus linearis* is known from the Lower Cambrian sandstones throughout the United States. A different variety is reported from the Hardyston quartzite. No new name is suggested because of poor preservation and lack of material.
39. Stratigraphy of the Paleozoic, Mesozoic, and Cenozoic rocks, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 204-292, illus., 1939. Cambrian, Ordovician, Silurian, and Triassic rocks and Quaternary glacial deposits are evident in the county. Each is discussed. Wisconsin, Illinoian, and Jerseyan till is present. Kames and glacial Lake Packer are discussed and questioned.
40. (and Fraser, Donald McCoy). Structure, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 293-310, illus., 1939. Practically every type of geological structure is present. Much is obscure. Overturned folds and faults are common. Individual local features are described. Sections are illustrated.
41. Graphite, *in* Non-metallic minerals [of Pennsylvania], by R. W. Stone: Pa. Geol. Survey 4th ser., M-18C, p. 18-22, 1940. A generalized discussion of the graphite deposits of southeastern Pennsylvania is presented. Most of it occurs in the Pickering gneiss of Precambrian age.
42. Development of knowledge of the geography and geology of Lehigh County with bibliography and cartography, *in* Lehigh County, Pennsylvania, by B. L. Miller: Pa. Geol. Survey 4th ser., C-39, p. 23-62, 1941. A historical bibliography of references on the geology and geography of the county from 1715-1940 is given.
43. (and Myers, Phillip B.). Hardyston formation, *in* Lehigh County, Pennsylvania, by B. L. Miller: Pa. Geol. Survey 4th ser., C-39, p. 165-180, illus., 1941. The Cambrian quartzite crops out in a band around the Reading Prong. Jasper occurs as cementing and replacement material.
44. (and others). Lehigh County, Pennsylvania: Pa. Geol. Survey 4th ser., C-39, viii, 492 p., illus. incl. geol. map, 1941. This contains articles by numerous authors which are cited individually. It is a complete discussion of the geology of the county. Precambrian-Pleistocene rocks are present. Iron, zinc, and slate are the chief mineral resources. Analyses are made.
45. Physiography, *in* Lehigh County, Pennsylvania, by B. L. Miller: Pa. Geol. Survey 4th ser., C-39, p. 106-137, illus., 1941. Lehigh County is in the Triassic

Lowlands, the New England province, and the Ridge and Valley Province. Erosion surfaces, caves, water and wind gaps, and streams are extensively discussed.

46. (and Behre, Charles H.). Slate *in* Lehigh County, Pennsylvania, by B. L. Miller: Pa. Geol. Survey 4th ser., C-39, p. 401-416, illus., 1941. This is a complete description and discussion of the slate in the Martinsburg Formation. Cross sections are presented.
47. Stratigraphy, *in* Lehigh County, Pennsylvania, by B. L. Miller: Pa. Geol. Survey 4th ser., C-39, p. 138-245, illus., 1941. Precambrian-Pleistocene formations are described and correlated. Sections are measured; fossils are listed, and analyses are made.
48. Structural sections of Kittatinny (Blue) Mountain in eastern Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 53, p. 1806, 1942.
49. Memorial to Freeman Ward [1879-1943]: Geol. Soc. Amer., Proc. 1943, p. 243-248, port., 1944.
50. Memorial to Harry Justin Roddy [1856-1943]: Geol. Soc. Amer., Proc. 1943, p. 225-228, port., 1944.
51. Specific data on the so-called "Reading overthrust" [Berks, Lehigh, and Northampton Counties]: Geol. Soc. Amer., Bull. 55, p. 211-254, illus. incl. geol. maps, 1944. Field evidence resists the Reading Overthrust idea proposed by Stose and Jonas. Intermontane valleys are local structures rather than windows. The jasper is in a sedimentary horizon and is not the result of silicification along the thrust plane. Gravity data are included.

MILLER, DONALD J.

1. Petrology of the Waynesburg sandstone in the Dunkard Basin: M.S. thesis, Univ. Illinois, 1942.

MILLER, EDWARD

1. Geological description of a portion of the Alleghany Mountains [Cambria, Bedford, and Huntingdon Counties] . . .: Geol. Soc. Pa., Trans. 1, p. 251-255, illus., 1835. A section of [Silurian-Pennsylvanian] rocks is carefully described and shown on a cross section.

MILLER, RALPH LEROY

1. Martinsburg limestones in eastern Pennsylvania: Geol. Soc. Amer., Bull. 48, p. 93-112, illus., 1937; discussion by G. W. Stose, p. 2032-2034, illus.; reply by author, p. 2034-2037. Unfossiliferous limestones are shown to be interbedded with shale at the base of the Martinsburg Formation. Some are massive and others very shaly. They are lenticular, at different horizons, and limited in extent. Stose disagrees with correlations, not facts.
2. Stratigraphy of the Jacksonburg limestone: Ph.D. thesis, Columbia Univ., 1937; Geol. Soc. Amer., Bull. 48, p. 1687-1717, illus., 1937. The formation is divided into two parts, the lower "cement limestone" and the upper "cement rock." The limits are not easily discernible. The "cement rock" is named Leesport east of the Schuylkill River. Altered volcanic ash is present. A boulder conglomerate is found within the Jacksonburg Formation. The Martinsburg Formation overlies different parts of it unconformably. Fossils are listed; sections are measured.
3. Preglacial course of the Delaware River: Pa. Acad. Sci., Proc. 12, p. 107-113, illus., 1938. Regional structure and behavior of modern streams in the upper Delaware Valley strongly show that the former course of the river was through Culver Gap. Two alternate courses south of the gap are presented, one southeastward to join the Hudson River and one southwestward to joint the present Delaware River.
4. Jacksonburg formation, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 249-262, illus., 1939. The Jacksonburg Formation overlies Beekmantown rocks and underlies the Martinsburg Formation. Two lithic facies are present, a lower cement limestone, and an argillaceous unit above. Sections are measured; fossils are listed. The thickness varies.
5. Jacksonburg formation, *in* Lehigh County, Pennsylvania, by B. L. Miller: Pa. Geol. Survey 4th ser., C-39, p. 202-213, illus., 1941. Impure black Ordovician limestone overlies Beekmantown rocks. Fossils are listed; ash is present. Cement rock is interbedded.

6. Origin of Crystal and Onyx Caves [Berks County] Pennsylvania: Pa. Acad. Sci., Proc. 15, p. 62-73, 1941. The caves are in limestones which are interbedded in the Martinsburg shale near the base. The caves were created mainly below the water table, and were emptied as the water table was lowered. When they were exposed, precipitation began. They began to form in late Tertiary time.

MILLER, SAMUEL ALMOND, 1837-1897.

1. North American Mesozoic and Cenozoic geology and paleontology: Cincinnatti Soc. Nat. Hist., Jour. 2, p. 140-161, 223-244, 1879; 3, p. 9-32, 79-118, 165-202, 245-288, 1880; 4, p. 3-46, 93-144, 183-234, 1881. Also as a book: 383 p., illus., Cincinnati, 1881. This is essentially a review of the literature showing the major contributors to each Period. The Commonwealth is included.
2. Brief mention of some of the men who aided in developing the science of geology in America, but who are known no longer except by their works: Cincinnati Soc. Nat. Hist., Jour. 5, p. 101-115, 1882. Brief biographical sketches of over 25 geologists, some of whom contributed to the Commonwealth, are given.
3. (and Gurley, William Frank Eugene). New species of Paleozoic invertebrates from Illinois and other states: Ill. State Museum Nat. Hist., Bull. 11, 50 p., illus., 1896. *Conularia roeperi* is described and illustrated from the [Pennsylvanian] of Luzerne County.

MILLER, WILLIAM JOHN

1. Pre-Cambrian folding in North America: Geol. Soc. Amer., Bull. 34, p. 679-702, illus., 1923. The Commonwealth is included. The Precambrian rocks have been deformed by Paleozoic movements and are hard to decipher. They conform by and large to Appalachian trends, but some north-south features are evident.

MILLS, JOHN ROSS

1. (and Taylor, Russel N.). Silurian-Devonian relationships in Schuylkill County, Pennsylvania: Pa. Acad. Sci., Proc. 23, p. 49-57, illus., 1949. Detailed sections are measured, and correlations are made with nearby areas. The Oriskany and Helderberg Formations are absent due to non-deposition.

MILLWARD, WILLIAM

1. Fossils from the glacial drift and from the Devonian and Mississippian near Meadville [Crawford County], Pennsylvania: Carnegie Museum, Annals 5, p. 480-487, 1909. Chemung fossils are common in the glacial drift; they are listed. The fossils of the bedrock are also listed. These are Mississippian.

MINOT, CHARLES SEDGWICK

1. A tribute to Joseph Leidy [1823-1891]: Science ns 37, p. 809-814, 1913.

MISER, HUGH DINSMORE

1. [Charles] David White [1862-1935]: Amer. Assoc. Petroleum Geologists, Bull. 19, p. 925-931, port., 1935.
2. [Charles] David White [1862-1935]: Amer. Assoc. Petroleum Geologists, Bull. 20, p. 625-632 illus., 1936.

MITCHELL, THOMAS D. See also Manners, John, 1.

1. Analysis of malachite or green carbonate of copper of Perkioming [Chester County], Pennsylvania: Columbian Chemical Soc. Phila., Mem. 1, p. 125-126, 1813. Malachite is analyzed and described.

MITCHILL, SAMUEL L.

1. Observations on the geology of North America, *in* Essay on the theory of the earth: by G. Cuvier, p. 321-431, New York, 1818. "Advances the idea that there were "barriers which probably restrained the waters in some parts of North America after the Ancient Ocean had retired." Believes that Blue Mt. was such a barrier or dam "by which the waters were restrained for a considerable time." In describing the Delaware Water gap he says, "the vastness of the dismemberment impresses every traveller with a sense of its present grandeur, and of the prodigious force necessary to rend the mountain from its summit to its base." Lehigh gap was formed in a similar way. Before the bursting of the mountain at Lehigh gap and Delaware water gap, the water of the sea was partially discharged through the Wind Gap"—B. L. Miller.

MITMAN, CARL W.

1. The Precambrian limestone in Pennsylvania: E.M. thesis, Lehigh Univ., 1911.

MOMBERT, JACOB ISADORE, 1829-1913.

1. Geology, *in* An authentic history of Lancaster County in the State of Pennsylvania: viii, 617 p., illus., Barr and Co., Lancaster, 1869. A short chapter includes a brief description of the geology of the county and includes a geological map.

MONROE, WATSON H.

1. Nelson Horatio Darton (1865-1948): Amer. Assoc. Petroleum Geologists, Bull. 33, p. 116-123, port., 1949.

MONTGOMERY, J. G. See Sisler, James Donaldson, 26.

MOODIE, ROY LEE

1. The Carboniferous quadrupeds—those of . . . Pennsylvania in their relation to the classification of the so-called Amphibia and Stegocephala: Kans. Acad. Sci., Trans. 22, p. 239-247, illus., 1909. This is a general discussion of the amphibian-reptilian relationships; examples are taken from the Commonwealth. The so-called reptiles from the Commonwealth may not be reptiles.
2. The Coal Measures Amphibia and the Crossopterygia: Amer. Naturalist 49, p. 637-644, 1915. A discussion of the origin of the amphibians. Details are taken from those of the Pennsylvanian, some in the Commonwealth. The earliest of the Pennsylvanian Amphibia are well-developed.
3. The Coal Measures Amphibia of North America: Carnegie Inst. Washington, Pub. 238, 222 p., illus., 1916. A monograph on the group includes descriptions of Amphibia from Beaver and Allegheny Counties.

MOOK, RUTH RAEDER

1. A new cephalopod from the Silurian of [Columbia County] Pennsylvania: Amer. Jour. Sci. 4th ser. 40, p. 617-620, 1915. *Trochoceras grovaniense* is described from the Bossardville limestone.

MOORE, ELWOOD S. See also Butts, Charles, 16.

1. Siliceous oolites and other concretionary structures in the vicinity of State College [Centre County], Pa.: Jour. Geology 20, p. 259-269, illus., 1912. Calcareous and siliceous oolites occur in the limestones which are transitional between the Cambrian and Ordovician. The siliceous ones are formed by the replacement of limestone, the silica coming from sponge spicules, etc.
2. Kaolin from Cambrian quartzite in [Blair, Centre, and Huntingdon Counties] Pennsylvania, *in* High grade clays of the eastern United States . . ., by H. Reis: U. S. Geol. Survey, Bull. 708, p. 92-99, illus., 1922. White residual clays occur in the Gatesburg Formation in the Nittany Valley. They come from argillaceous strata within the formation. They occur as irregular masses associated with limonite ore, though they are never mixed. Individual properties are described.
3. White clay deposits in central Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 45, 7 p. (#), illus., 1922. White clay is common as a residual deposit from the Cambrian Gatesburg Formation. The clay comes from argillaceous units in the otherwise sandy formation. The occurrence and distribution are described, as are various mining operations.
4. (and Taylor, T. G.). The silica refractories of Pennsylvania: Pa. Geol. Survey 4th ser., M 3, 100 p., illus., 1924. The Tuscarora quartzite is the biggest source of silica refractory material. The Chickies Formation is a local source of mica schist for silica refractories. Each is described in detail from quarries. Analyses are made; photomicrographs are included. The reserves are enormous.

MOORE, RAYMOND CECIL

1. Paleogeographic significance of graptolite beds of eastern United States [abs.]: Pan-Amer. Geologist 49, p. 228; Geol. Soc. Amer., Bull. 39, p. 292-293, 1928.
2. Late Paleozoic crustal movements of Europe and North America: Amer. Assoc. Petroleum Geologists, Bull. 19, p. 1253-1305, illus., 1935; discussion by P. B. King, p. 1306-1307. The late Paleozoic section in the Commonwealth and elsewhere is described. The various orogenies are delimited, described, and correlated with those in Europe. Very little about the Commonwealth is included.
3. "Carboniferous" rocks of North America: Internatl. Geol. Cong., 16th, U.S. 1933, Rpt. 1, p. 593-614, illus., 1936; discussions, p. 614-616. A generalized description of the Mississippian and Pennsylvanian rocks in North America

includes the Commonwealth. Gross correlations are made. This is a review, with few details.

4. Comparison of the Carboniferous and early Permian rocks of North America and Europe: Internatl. cong. carbonifère 2nd, Heerlen 1935. C. R. 2, p. 641-676, illus., 1937. A general discussion of the Mississippian-Permian rocks in the United States is given, including the Commonwealth. The sections are compared with the European section.
5. (Chairman, and others). Correlation of Pennsylvanian formations of North America (Chart no. 6): Geol. Soc. Amer., Bull. 55, p. 675-706, illus., 1944. A time-rock chart of the Pennsylvanian formations in North America includes the Commonwealth. Very brief discussions of the major correlation problems are included.
6. (and Thompson, Marcus Luther). Main divisions of Pennsylvanian Period and System: Amer. Assoc. Petroleum Geologists, Bull. 33, p. 275-302, illus., 1949. A three-fold division of the Pennsylvanian is proposed. Reference is made to the Commonwealth, although the type areas are in Oklahoma and Kansas. They are, from bottom to top: Ardian, Oklan, and Kawvian. The physical and paleontological bases are discussed.

MOORE, W. D.

1. On footprints in the Carboniferous rocks of [Allegheny County] western Pennsylvania: Amer. Jour. Sci. 3rd ser. 5, p. 292-293, 1873. Four-toed tracks of *Cheirotherium Reiteri* are described. They come from the Allegheny Formation, just below the Pittsburgh coal. Mud cracks are also present.

MORGANROTH, L. C.

1. The caves of Huntingdon Co., Pa.: Engineering and Mining Jour. 71, p. 664, 1901. A large new cave in the Lewistown limestone of Ordovician age is reported.
2. Pennsylvania fire clay: Amer. Inst. Mining Engineers, Bull. 110, p. 475-481, 1916; Trans. 54, p. 477-483, 1917; discussion by D. B. Reger, p. 483-484. The underclays of the coal regions are described. Their extent is considered, but not their origin.

MORNINGSTAR, HELEN

1. The origin of the Newark series in the Philadelphia district [Montgomery County] [abs.]: Science ns 43, p. 395-396, 1916.

MORTON, SAMUEL GEARGE, 1799-1851.

1. Analysis of tabular spar from Bucks County, Pennsylvania, with a notice of various minerals found at the same locality: Acad. Nat. Sci. Phila., Jour. 6, p. 46-49, 1829. [Wollastonite], scapolite, pyroxene, zircon, mica, blue quartz, feldspar, garnet, moroxite, graphite, pyrite, and titanium oxide are reported from near Van Artsdalen's quarry. No details are included.
2. A memoir of William Maclure [1763-1840] . . .: 37 p., port., Philadelphia, 1841; 2nd ed., 33 p., port., Philadelphia, 1844.
3. A memoir of William Maclure [1763-1840] . . .: Amer. Jour. Sci. 47, p. 1-17, port., 1845.

MOSIER, McHENRY. See also McIntosh, Frank K., 1.

1. Bamford zinc mine, Lancaster County, Pa.: U. S. Bur. Mines, Rpt. Inv. 4247, 3 p. (#), illus., 1948. Two parallel bed-veins in limestone contain galena and sphalerite; they are disseminated and in stringers. Cores were drilled.

MOSS, JOHN HALL. See also Meyerhoff, Howard Augustus, 7.

1. Evidence for the climatic origin of the lower Susquehanna River terraces at Highspire [Dauphin County]: Pa. Acad. Sci., Proc. 23, p. 63-66, 1949. Boulders in the terrace gravel are from outcrops outside the terminal moraine. They may have been dislodged by intense periglacial frost and fallen onto the frozen river which, when broken up, ice-rafted the boulders southward to deposit them.

MOYD, LOUIS STEPHEN

1. Evidence of sulphide-silicate immiscibility at Gap nickel mine [Lancaster County], Pennsylvania: Amer. Mineralogist 27, p. 389-393, illus., 1942. Rounded masses of amphibole occur in a sulphide matrix. This occurrence is used as an example of immiscibility. The two materials were crystallizing in a viscous medium.

MOYER, FORREST THEODORE. See also Cumings, W. L., 2; Hickok, William Orville, 4th, 10.

1. Statistics on petroleum, natural gas, and allied interests, *in* Contributions to oil and gas geology of western Pennsylvania: Pa. Geol. Survey 4th ser., M 19, p. 42-88, 1933. Included among statistical tables are deep-well records recording the depths to various prominent sandstones. Ordovician rocks are reached in some.
2. Structure and stratigraphy of Fayette county (preliminary report): Pa. Topog. Geol. Survey 4th ser., Bull. 115, 20 p. (#), illus., 1937. A complete geologic description of the area is given. Devonian-Pennsylvanian, and Pleistocene rocks are present. Folds characterize the structure; faults are rare. Sections are measured.

MOYER, W. IRWIN

1. The natural gas fields of eastern United States and their probably future life: Natural Gas Assoc. Amer., Proc. 15th Ann. Mtg. 1920, p. 44-59, illus., 1921; discussion by I. C. White and others, p. 60-68. A very generalized description of the stratigraphy of western Pennsylvania is given. The McKeesport [Westmoreland County] field is described in detail.

MÜGGE, O.

1. Ueber Pseudomorphosen von coelestin nach Fasergyps [Blair County]: Neues Jahrb. Mineralogie, Geologie, u Paleontologie 1899, bd. 2, p. 187-188, Stuttgart, 1899. Celestite is thought to be pseudomorphous after fibrous gypsum.

MUNN, MALCOLM JOHN. See also Griswold, William Tudor, 2; Shaw, Eugene Wesley, 2, 3, 4.

1. Petroleum and gas, *in* Review of general geology of southwestern Pennsylvania in light of recent work: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1906-08, p. 266-306, 1908. A generalized discussion by quadrangle, of the various producing areas is given. Production is from Devonian and Mississippian sands.
2. Studies in the application of the anticlinal theory of oil and gas accumulation—[Part 1] [Sewickley quadrangle, Allegheny County]: Economic Geology 4, p. 141-157, illus., 1909; discussion by F. G. Clapp, p. 565-570; Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1, p. 18-21, 1910. Production is from seven Devonian and Mississippian sands. Most of the production comes from anticlinal crests, or near them. The oil-water separation due to gravity is not necessarily valid, although moving water has a lot to do with oil distribution. Clapp has agreements and disagreements with certain statements.
3. Geology of the oil and gas fields of the Clarion quadrangle [Armstrong-Clarion Counties], Pa.: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 3, 111 p., illus., 1910. Mississippian-Pennsylvanian surface rocks are described. Devonian rocks are known from well data. The structure is predominantly folds. Individual oil pools are described; all production is from Devonian rocks.
4. Geology of the oil and gas fields of the Sewickley quadrangle [Allegheny, Beaver, and Butler Counties], Pa.: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1, 70 p., illus. incl. geol. map, 1910. Only Pennsylvanian rocks are present at the surface. Wells penetrate to the Chemung Formation; well logs are included. The subsurface structure is discussed in detail; anticlines and synclines are most prominent. Various oil and gas pools are described individually. Sands in the Mississippian and Devonian are the producers.
5. Description of the Sewickley quadrangle [Allegheny, Butler, and Beaver Counties], Pa.: U. S. Geol. Survey, Geol. Atlas of U. S. folio 176, 16 p., illus. incl. geol. maps, 1911. A complete geologic description of the area is given. Pennsylvanian and Pleistocene rocks are exposed at the surface. Devonian rocks are present in wells. Broad folds comprise the structure. Petroleum, gas, and coal are the major mineral resources. Clay, stone, sand, and limestone are also present.
6. Oil and gas of the Carnegie quadrangle [Allegheny-Washington Counties], Pennsylvania: U. S. Geol. Survey, Bull. 456, 99 p., illus., 1911. Devonian-Permian rocks are described in detail. The structure consists of gentle folds. The oil and gas comes from Devonian-Mississippian sands. Individual pools are described. Partial well-records are included.
7. Description of the Claysville quadrangle [Greene-Washington Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 180, 14 p., illus. incl. geol. maps,

1912. A complete geologic description of the area is given. Pennsylvanian-Permian, and Pleistocene rocks are mapped. Devonian rocks are described from wells. Sections are measured. The rocks are essentially flat-lying. Petroleum, gas, and coal are the chief mineral resources. Limestone, sandstone, clay, and shale are also described.

8. Problems of oil and gas accumulation in the Appalachian region [abs.]: Wash. Acad. Sci., Jour. 2, p. 428-429, 1912.

MURDY, RICHARD JAMES

1. Thickness and character of the sub-Trenton interval in the Appalachian Basin: M.S. thesis, Univ. Pittsburgh, 1948.

MURPHY, MARION. See Murphy, Raymond Edward, 1.

MURPHY, RAYMOND EDWARD

1. (and Murphy, Marion). Pennsylvania, a regional geography: x, 589 p., illus., Pa. Book Service, Harrisburg, 1937. This is a textbook of geography which includes a detailed description of the physiography. Landforms, drainage, mineral wealth, climate, and soils are included.

MURRAY, DAVID

1. A catalogue of the published works of James Hall, 1836-1882 [with supplement to 1883]: New York State Museum, Ann. Rpt. 36, p. 79-94, 1883; 42, p. 75-97, 1889.

MYERS, CLAY KENTON

1. The red beds of the Pittsburgh quadrangle [Allegheny County]: M.S. thesis, Univ. Pittsburgh, 1935.

MYERS, PHILIP B. See also Miller, Benjamin LeRoy, 32, 43.

1. The Hardyston formation in Lehigh and Northampton Counties, Pennsylvania: M.A. thesis, Lehigh Univ., 1934.
2. The origin of jaspers in Lehigh and Northampton Counties, Pa.: Pa. Acad. Sci., Proc. 8, p. 87-92, illus., 1934. Jasper occurs in east-west bands in Hardyston quartzite and in Cambro-Ordovician limestones. Thin sections show the jasper to have been deposited as a hydrous gel. Microscopic descriptions are given.

MYERS, RICHMOND ELMORE

1. The Mauch Chunk carnotite [Carbon County]: Rocks and Minerals 10, p. 155, 1935. A popular account of the carnotite occurring in the Pottsville conglomerate is given.
2. The Hardyston jasper of the Reading Hills in [Berks-Lehigh Counties] Pennsylvania: Rocks and Minerals 15, 219-225, illus., 1940. A popular account of the occurrence of jasper in the Hardyston sandstone is given.
3. Structure and possible origin of Leibert's Gap [Lehigh County]: Pa. Acad. Sci., Proc. 17, p. 101-104, 1943. The gap is a result of structural weakness, allowing a small stream to cut a large gap rather than as a result of the overflow of Packer Lake, as postulated by Williams.
4. The geology of Spring Mountain in Montgomery County, Pennsylvania: Rocks and Minerals 18, p. 272-273, 278, 1943. A popular account of the Triassic history of the area, along with present day physiography, is given.
5. Geology as seen at Buck Hill in the Poconos [Monroe County]: Rocks and Minerals 19, p. 339-342, 1944. A popular account of the geological history of the Pocono area is given.
6. Observations on Pennsylvania geology and minerals, collected from various diaries, journals, reports, etc., published between 1698-1802: Pa. Acad. Sci., Proc. 19, p. 113-123, 1945. Extracts from letters and diaries regarding geological phenomena of eastern Pennsylvania are given. No geological data are given, but they have great historical interest.
7. Possible drainage change in the Lehigh Valley as suggested by an investigation into the origin of Leibert's Gap in the Reading Hills [Lehigh County]: Rocks and Minerals 24, p. 9-17, illus., 1949. Leibert's Gap was formed in the Tertiary by the Lehigh River before it was pirated to the Delaware River. The Hosensack fanglomerate was deposited south of the gap by the original stream.

MYERS, THURMAN H.

1. Past developments and future possibilities of the Oriskany sand in the Appalachian area, *in* Appalachian Geological Society, Oriskany Sand Sym-

posium: p. 21-30, illus., 1937. The Oriskany sandstone in the Commonwealth is described and discussed as a reservoir.

MYERS, WILLIAM MARSH. See also Krynine, Paul Dimitri, 8.

1. Memorial of Arthur Pharaoh Honess [1887-1942]: Amer. Mineralogist 28, p. 151-154, port., 1943.
2. Post-Paleozoic mineralization in Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 56, p. 1184, 1945; Economic Geology 40, p. 599, 1945.
3. (and Zerfoss, Samuel). Frederick Augustus Genth, 1820-1893, chemist, mineralogist, collector: Franklin Inst., Jour. 241, p. 341-354, illus. incl. port., 1946; Pa. State College Mineral Industry Experiment Sta., Circ. 27, 1946.

NARRAWAY, J. E. See Raymond, Percy Edward, 6.

NARTEN, PERRY FOOTE, 2nd.

1. The Pottsville-Pocono contact in western Pennsylvania: M.A. thesis, Washington Univ., St. Louis, 1948.

NEEDHAM, B.

1. Report on the Tunungwant coal field of McKean Co., Pa.: Mining Mag. 9, p. 306-316, New York, 1857. The various coal seams in the [Pennsylvanian] are described and analyzed in part. Cannel coal is also present. Reserves of the field are estimated.

NEILSON, JAMES

1. (and others). Addresses commemorative of George Hammell Cook [1818-1889] . . .: 53 p., port., Newark, N. J., 1891.

NELSON, LLOYD A.

1. A partial index and bibiography of the Devonian faunas of North America: M.S. thesis, Univ. Colo., 1929.

NELSON, WILBUR ARMISTEAD

1. Topography of the former continent of Appalachia (from geologic evidence): Amer. Geophysical Union, Trans. [21], p. 786-796, illus., 1940. Appalachia as a continent is considered from period to period based upon the rock record. Part of the discussion includes Pennsylvania.
2. (and Edmundson, Raymond Smith). In memoriam, Charles Butts, Sept. 18, 1863- Oct. 5, 1946: Va. Acad. Sci., Proc. 1946-47, p. 105-106 [1947?].

NEMINARZ, EDWARD F.

1. Klinochlor von Chester City [!County], Pennsylvania: Mineralogische Mitth. [4], 1874, p. 176-177, Vienna, 1874. A sample of the mineral is analyzed.
2. Magnesiaglimmer von Penneville [?Pennsville, Bucks County], Pennsylvania: Mineralogische Mitth. [4] 1874, p. 241-242, Vienna, 1874. The muscovite is analyzed.

NESBITT, ROBERT H. See Philbrick, Shailer Shaw, 1.

NETTLETON, EDWIN S.

1. On the first systematic collection and discussion of the Venango Co. oil wells of western Pennsylvania: Amer. Phil. Soc., Proc. 16, p. 429-495, 1877. One hundred forty-one generalized well logs are presented, showing depth to and thickness of the various sand units in the area. No synthesis is attempted. All are in the [Devonian], and a few are in surrounding counties.

NETTLETON, LEWIS LOMAX

1. Relation of gravity to structure in the northern Appalachian area: Geophysics 6, p. 270-286, illus., 1941. A gravity traverse from Pittsburgh to the Piedmont is made. The large folds and faults of the steeply folded region have small anomalies. The primary gravity features are caused by deep mass-distributions which are not evident at the surface.

NEUMANN, FRANK

1. United States earthquakes, 1934 [Erie County]: U. S. Coast and Geodetic Survey, serial 593, 101 p., illus., 1936; 1936 [Mercer County]: serial 610, 45 p., illus., 1938; 1937 [Berks County]: serial 619, 55 p., illus., 1940; 1938 [Blair County]: serial 629, 59 p., illus., 1940; 1940 [Dauphin County]: serial 647, iii, 74 p., illus., 1942. Considering the seismic activity of the continent as a whole, the Commonwealth is notably free of shocks.

NEUMANN, GUSTAV LEO

1. Investigation of the Dillsburg magnetite deposits, York County, Pa.: U.S. Bur. Mines, Rpt. Inv. 4145, 13 p. (#), illus., 1947. A brief description of

the deposit is followed by maps of magnetic anomalies and drill-hole records. No conclusions are presented.

NEVIUS, J. NELSON

1. Dr. James Hall [1811-1891]: Engineering and Mining Jour. 66, p. 184, port., 1898.

NEWBERRY, JOHN STRONG, 1822-1892.

1. On the origin of quartz pebbles in the Carboniferous conglomerate: Family Visitor 1, [p. unknown] Cleveland, 1851 [not seen].
2. On the gas wells of Ohio and Pennsylvania: Lyceum of Nat. Hist. New York, Proc. 1, p. 266-270, 1871. A review of the physical conditions of the gas production in the northwest counties. The source is the bituminous and carbonaceous shales of [Lower Devonian] age and comes from [post-Lower Devonian] rocks.
3. The iron resources of the United States: International Review 1, p. 754-780, 1874. A brief, popular account of the occurrences of iron ore includes the Commonwealth.
4. Descriptions of new Paleozoic fishes [Wyoming County]: New York Acad. Sci., Annals 11, p. 188-192, 1878. *Glyptopomus sayrei* from the Catskill Formation is included among the descriptions.
5. The genesis of our iron ores: Columbia Univ., School of Mines Quarterly 2, p. 1-17, 1880; Engineering and Mining Jour. 31, p. 286-287, 298-300, 1881. In a generalized discussion of the iron, the Clinton ores are thought to be sedimentary, the carbonate ores are lake deposits, and the limonites are considered residual and secondarily altered from hematite.
6. Descriptions of some peculiar screw-like fossils from the Chemung rocks [Warren County]: New York Acad. Sci., Annals 3, p. 217-220, illus., 1885; additions, Trans. 3, p. 33-34, 1885. *Archemides*-like spirals are described, and while uncertain, they are most likely seaweeds. *Spiraxis randalli* is the name given.
7. On the American Trias [abs.]: New York Acad. Sci., Trans. 5, p. 18-19, 1885.
8. The Paleozoic fishes of North America: U.S. Geol. Survey. Mon. 16, 340 p., illus., 1889. Fish from the Silurian to Permian are described and illustrated. Many are from the Commonwealth, especially the Devonian.
9. The first oil well, the birth of a great industry: Harper's Mag. 81. p. 723-729, 1890. A popular account of petroleum in the Commonwealth and elsewhere in the country is given.

NEWBY, JERRY B.

1. (and others). Bradford oil field, McKean County, Pa., and Cattaraugus County, N. Y.: *in* Structure of typical American oil fields 2, p. 407-422, illus., Amer. Assoc. Petroleum Geologists, Tulsa, 1929. Petroleum comes from the Devonian Bradford sand in Appalachian structures, all of which are described. The Devonian-Mississippian section is listed, and a structure contour map is included.

NEWHOUSE, WALTER, HARRY. See also Callaghan, William H., 1.

1. Mineral zoning in the New Jersey-Pennsylvania—Virginia Triassic area: Economic Geology 28, p. 613-633, illus., 1933. Magnetite was deposited in metamorphosed limestone by intrusive diabase. Its distribution is related to structure. Metamorphic aureoles are present. To the north and south of the Commonwealth, copper mineralization is present under similar geologic conditions. The size of the body, the amount of iron in the country rock, and the depth of the Triassic erosion surface seem to have some influence.

NEWMYER, AMEL JAMES, JR.

1. A study of cyclical sedimentation adjacent to the Pittsburgh coal seam, southeast Pittsburgh [Allegheny County]: M.S. thesis, Univ. Pittsburgh, 1948.

NEWTON, HENRY, 1845-1877.

1. The ores of iron—their geographical distribution . . .: Amer. Inst. Mining Engineers, Trans. 3, p. 360-391, 1875. A resumé of iron-ore occurrences includes very brief descriptions of those in the Commonwealth.

NICOL, WILLIAM

1. Spinel twins of pyrite [Delaware County], [abs.]: Amer. Jour. Sci. 4th ser. 17, p. 93, 1904.

NICOLLS, WILLIAM JASPER

1. The story of American coals: 405 p., Lippincott, Philadelphia, 1897; 2nd ed., 396 p., 1904. This is a popular treatise on all aspects of coal geology and production. Examples are taken from the Commonwealth.

NOLTING, JOHN B., JR. See Fridley, Harry Marion, 2.

NORTH, WILLIAM. See Hadley, Arthur Twining, 2.

NORTHROP, JOHN D.

1. [Map of] Oil and gas fields [of the United States] in 1916, corrected to March 1917, 4 sheets: Scale, 1:2,500,000, (1 inch equals 40 miles), U. S. Geol. Survey, 1947.

NORTHUP, M. ALLEN

1. New occurrences of millerite [Luzerne County]: Amer. Mineralogist 22, p. 1184-1185, 1937. Millerite blades occur in spaces between quartz and ankerite. They are described from West Pittston.
2. The minerals of West Pittston [Luzerne County], Pa.: Rocks and Minerals 12, p. 18-20, 1937. Calcite, quartz, pyrite, ankerite, gypsum, and kilserite (?) are reported from culm heaps.
3. A new occurrence of millerite—further notes on the Sullivan Trail Coal Co. [Luzerne County]: Rocks and Minerals 13, p. 304-305, 1938. Millerite occurs as joint fillings in the black shale along with sphalerite, pyrite, barite, pyrophyllite, and chlorite, in concretions, and in other sedimentary forms.

OGILIVIE, IDA HELEN

1. Florence Bascom, 1862-1945: Science ns 102, p. 320-321, 1945.

OKLAHOMA GEOLOGICAL SOCIETY

1. Appreciation of Doctor [Charles] David White [1862-1935]: Amer. Assoc. Petroleum Geologists, Bull. 19, p. 931-932, 1935.

OLMSTEAD, ELIZABETH WARREN. See also Meyerhoff, Howard Augustus, 1, 2, 3, 4, 5, and 6.

1. The physiographic development of the Reading Prong: M.S. thesis, Smith College, 1933.

O'NEILL, WAYNE FRAZIER

1. Stratigraphy and structure of Godfrey Ridge [Monroe County]: Pa. Acad. Sci., Proc. 14, p. 45-49, illus., 1940. Silurian-Lower Devonian rocks are described. The anticlinal structure at several places along the ridge is shown by cross section.
2. Columnar Silurian limestone in [Monroe County] Pennsylvania: Pa. Acad. Sci., Proc. 15, p. 75-81, illus., 1941. A Silurian limestone with basalt-like columnar jointing is described. The joints are explained as mud-crack-like shrinking during Silurian exposure. Several other examples are cited.

ORTMANN, ARNOLD E.

1. The geological origin of the freshwater fauna of Pennsylvania: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1910-12, p. 135-149, 1912. Mussel and crayfish distribution supports the idea of drainage changes during the Pleistocene. There are three generalized fauna: northern, eastern, and western. When the ice dammed the north-flowing streams and caused the drainage to go south, the fauna from the eastern and western drainages were able to "cross the divide" and get into the northern drainage area.

ORTON, EDWARD, 1829-1899.

1. Leo Lesquereux [1806-1899]: Amer. Geologist 5, p. 284-296, port., 1890.
2. [John Strong Newberry, 1822-1895]: Ohio Mining Jour. 22, p. 12-17, port., 1896; discussion, p. 18.

OSBORN, HENRY FAIRFIELD

1. A great naturalist, Edward Drinker Cope [1840-1897]: Century Mag. 55, p. 10-15, port., illus., 1897.
2. Edward D[rinker] Cope [1840-1897]: Science ns 5, p. 705-717, port., 1897.
3. Edward Drinker Cope [1840-1897]: Popular Science Monthly 70, p. 314-316, port., 1907.
4. Joseph Leidy, 1823-1891: Natl. Acad. Sci., Biog. Mem. 7, p. 335-396, port., 1913.
5. Joseph Leidy [1823-1891], founder of vertebrate paleontology in America: Acad. Nat. Sci. Phila., Proc. 75 [Appendix], p. 54-61, 1924; Science ns 59, p. 173-176, 1924.

6. (and others). Bibliography of Edward Drinker Cope, 1859-1915: Natl. Acad. Sci., Biog. Mem. 13, p. 172-317, 1930.
7. Biographical memoir of Edward Drinker Cope, 1840-1897: Natl. Acad. Sci., Biog. Mem. 13, p. 125-171, port., 1930.
8. Cope, master naturalist: Science ns 73, p. 225-227, 1931.
9. Cope—Master naturalist, the life and letters of E[dward] D[rinker] Cope, with a bibliography . . .: 740 p., illus. incl. port., Princton Univ. Press, 1931.

OTSUKA, S.

1. A short sketch on the petroleum industry of Europe and America: Japan Geol. Soc., Bull. 16, no. 1., 82 p., illus., 1903 [in Japanese]. A review of the Devonian–[Pennsylvanian] stratigraphy of Western Pennsylvania includes a brief description of the oil-bearing formations.

OWEN, DAVID DALE, 1807-1860.

1. (and Sellers, F. W.). United States railway map . . . exhibiting the coal fields . . .: Scale, 1:2,200,000, Gibson, Cincinnati, 1855.
2. Geological report on the Tunungwant coal field of McKean Co., Pa.: Mining Mag. 9, p. 244-258, New York, 1857. Twelve coal beds in 830 feet of [Pennsylvanian] rocks are described and analyzed.

OWENS, WILLIAM G.

1. A meteorite from [Lycoming County] central Pennsylvania: Amer. Jour. Sci. 3rd ser. 43, p. 423-424, 1892; summarized *in* Description of four meteorites, by H. A. Ward: Rochester Acad. Sci., Proc. 4, p. 79-88, illus., 1902. A physical and chemical description of a seven-pound iron meteorite is given.

PACKARD, ALPHEUS SPRING, JR., 1831-1905.

1. Types of Carboniferous Xiphosaura new to North America [Luzerne County]: Amer. Naturalist 19, p. 291-294, 1885. Among others, *Euproops longispina* is described from the [Pennsylvanian] near Pittston. It comes from the shale over the Mammoth coal seam.
2. On the Carboniferous xiphosurous fauna of North America: Natl. Acad. Sci., Mem. 3, Part 2, p. 143-157, illus., 1887. *Prestwichia longispina* is described from Luzerne County in a general treatise on the group.

PALMER, LEWIS

1. New localities for chabazite [Delaware County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 38, 1882. Chabazite occurs as red crystals in hornblende gneiss near Waterville and Upland.

PANYITY, LOUIS SAMUEL. See Newby, Jerry B., 1.

PARKER, EDWARD WHEELER

1. The known coal fields of the United States: Mining World 22, p. 469-471, illus., 1905. An extremely brief review of the coal fields of the nation includes the Commonwealth.
2. Notes on the anthracite region: Mining and Metallurgy 178, p. 25-26, illus., 1921. A semi-popular account of the anthracite fields shows the structure and the mining problems resulting from it.

PARKER, G. HOWARD

1. A new locality for aquacreptite [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 56, 1882. Aquacreptite is reported from a seam or vein in partially decomposed mica gneiss west of Hestonville.

PARKER, JOHN MASON, 3rd

1. Faulting in the Nittany arch in central Pennsylvania: M.A. thesis, Cornell Univ., 1933.
2. Regional systematic jointing in slightly deformed sedimentary rocks [. . . northern Pa.]: Geol. Soc. Amer., Bull. 53, p. 381-408, illus., 1942. More than 6000 joints are plotted, including some from northern Pennsylvania. There are three contrasting regional sets. The joints formed independently of folds, faults, and regional dip. They are tension features, although the origin of one set is doubtful.

PARSONS, FLOYD W.

1. Coal mining by open stripping in [Schuylkill County] Pennsylvania: Engineering and Mining Jour. 81, p. 1239-1240, 1906. A description is given of a coal seam near Hazleton.

PARTZ, AUGUST

1. Towanda [Bradford County] mining company: Mining Mag. 3, p. 433-434, New York, 1854. Copper-bearing, Devonian, gray shales from Albany Twp. are discussed. A 4-16 inch bedded seam of copper minerals occurs. Some copper minerals are disseminated. The ore contains 3 to 44 percent copper.

PATRICK, AUSTIN LATHROP

1. (and others). Soil erosion survey of Pennsylvania: Pa. Agriculture Experiment Sta., Bull. 354, 23 p., illus., 1938. A detailed discussion of the problem includes many geologically-controlled phenomena, such as creep.

PATTAN, LEROY T.

1. Geology of the Beaver River valley between Beaver Falls and Wampum [Beaver County] Penn.: M.S. thesis, Iowa State Univ., 1916.

PAUL, W. J. See Fieldner, Arno Carl, 1.

PEALE, ALBERT CHARLES, 1849-1914.

1. Lists and analyses of the mineral springs of the United States: U.S. Geol. Survey, Bull. 32, 235 p., 1886. Forty-four springs are analyzed grossly from many different places in the Commonwealth.
2. Ferdinand Vandiver Hayden [1829-1887]: Phil. Soc. Washington, Bull. 11, p. 476-478, 1890.

PEARSE, JOHN B.

1. On some minerals of the chlorite group: Amer. Jour. Sci. 2nd ser. 38, p. 221-225, 1864. Color variations are shown to be the result of various amounts and kinds of impurities. Green, red, and red-green kämmererite crystals from Lancaster County are used as examples. Analyses are given.

PECHIN, EDMUND C.

1. The minerals of southwestern Pennsylvania: Amer. Inst. Mining Engineers, Trans. 3, p. 399-408, 1875; discussion by T. S. Hunt, p. 408-410; Engineering and Mining Jour. 19, p. 146-147, 226, 1875. The minerals associated with the iron industry are discussed in detail. Iron ore, coal, and limestone resources are considered. Clay is also an economic resource.

PECK, FREDERICK BURRITT, 1860-1925.

1. On serpentines and talcs in the vicinity of Easton [Northampton County], Pennsylvania [abs.]: Science ns 11, p. 229, 1900.
2. Preliminary notes on the occurrence of serpentine and talc at Easton [Northampton County], Pa.: New York Acad. Sci., Annals 13, p. 419-430, illus., 1901. Metamorphic rocks, chiefly hornblende gneiss, with interstratified dolomite or calcite are described in detail. Granite and syenite have been intruded. Serpentine and talc are associated with, and are a result of, faults in these rocks.
3. Basal conglomerate in Lehigh and Northampton Counties, Pa.: Geol. Soc. Amer., Bull. 14, p. 518-521, 1904. This is an enlarged abstract. The area is primarily near Easton. The rocks are probably Lower Cambrian. In general, coarse conglomerate is at the base. Above it is a typical arkose or quartzite interstratified with *Scolithus*-bearing quartzite. The upper member is a jaspery, ferruginous quartzite.
4. The cement belt in Lehigh and Northampton counties of Pennsylvania: Mines and Minerals 25, p. 53-57, illus., 1904. The Ordovician limestones are described and analyzed. A brief description of the overlying slate belt is included.
5. The talc deposits of Phillipsburg, N. J., and Easton [Northampton County], Pa.: New Jersey Geol. Survey, Ann. Rpt. 1904, p. 161-185, illus., 1905. Talc and serpentine quarries are described. No discussion of the circumstances of occurrence, age, or origin is included.
6. (and Ashley, George Hall). The Punxsutawney and Glen Campbell coal fields of Indiana and Jefferson Counties, Pennsylvania: U.S. Geol. Survey, Bull. 285, p. 276-279, 1906. These coal fields are discussed in general terms. Only Pennsylvanian rocks are present.
7. Geology of the cement belt, in Lehigh and Northampton Counties, Pa. . . .: Economic Geology 3, p. 37-76, illus., 1908. Cement rock occurs in the upper Trenton. It is argillaceous limestone. The structure is complex, including recumbent folding. Analyses are made. The distribution is described, as is the origin.

8. Preliminary report on the talc and serpentine of Northampton County and the Portland cement materials of the Lehigh district: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 5, 65 p., illus. incl. geol. map, 1911. Talc and serpentine occur in the Precambrian metamorphic rocks of the Reading Prong as a narrow band with a NE-SW direction just north of Easton. Rocks and quarries are described; analyses are made. The minerals came from pegmatitic, altered dolomitic limestones which were later metamorphosed. Cement rock comes from the Lehigh limestone just below the Martinsburg shale. The Cambro-Ordovician section is briefly discussed, as is the structure.
9. White clay deposits at Saylorsburg, Monroe County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 40, 8 p. (#), illus., 1922. White clay has formed by the leaching of the clayey parts of the limestone formations between the Oriskany sandstone and the Bossardsville limestone (Silurian).
10. Vanport limestone of Lawrence County, *in* Limestone of Pennsylvania, by B. L. Miller: Pa. Geol. Survey 4th ser., M-7, p. 292-304, illus., 1925; Topog. Geol. Atlas Pa. 5, p. 171-187, illus., 1929. The Vanport limestone (Pennsylvanian) is remarkably persistent and uniform. The thickness varies from 14 to 23 feet. It is described in detail. Sections are measured; analyses are made. It is a source of material for cement.

PECKHAM, STEPHEN FARNHAM, 1838-1918.

1. Report on the production, technology, and uses of petroleum and its products: U. S. 10th Census 10, 319 p., illus., 1884. A treatise on petroleum includes much data from the Commonwealth. No new information is added, however.
2. (and Lyman, Benjamin Smith). List of books, papers, and references on rock oil and gas: Pa. Geol. Survey 2nd, Ann. Rpt. 1886, Part 2, p. 828-895, 1887. A world-wide reference list includes many from and about Pennsylvania to date.

PELTIER, LOUIS COOK

1. Block fields in Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 56, p. 1190, 1945.
2. Pleistocene terraces of the Susquehanna River, Pennsylvania: Pa. Geol. Survey 4th ser., G 23, 158 p., illus., 1949. Terraces representing six Pleistocene stages are evident in the Susquehanna basin. Four are Wisconsin, and one or two are Illinoian. Scattered evidence of pre-Illinoian ice advance is evident. Sections are measured. Sand and loess are described as are periglacial deposits. Terraces on the two branches, the main river, and the Juniata River are considered.

PELTO, CHESTER R.

1. Petrology of the Gatesburg Formation of central Pennsylvania: M.S. thesis, Penn. State College, 1942.

PENFIELD, SAMUEL LEWIS, 1856-1906. See also Genth, Frederick Augustus, 27; Hermann, R., 5.

1. Chalcopyrite crystals from the French Creek iron mines, St. Peter, Chester Co., Pa.: Amer. Jour. Sci. 3rd ser. 40, p. 207-211, illus., 1890. The crystals are frequently over 1 cm. in diameter and occur in calcite or as a fibrous or compact scaly material. They are described completely.
2. On some curiously developed pyrite crystals from French Creek, Delaware Co., Pa.: Amer. Jour. Sci. 3rd ser. 37, p. 209-212, illus., 1899. Crystals with well formed faces are described and illustrated.

PENHALLOW, DAVID PEARCE, 1854-1910.

1. Notes on Erian (Devonian) plants from New York and [Susquehanna County] Pennsylvania: U.S. Natl. Museum, Proc. 16, p. 105-114, illus., 1893. *Haliserites dechenianus lineatus*, *H. lineatus*, *H. chondriformis*, and *Dictyotites fasciolus* are illustrated from the Chemung Formation near Lanesboro.

PENNYPACKER, CHARLES H.

1. The W. W. Jefferis [mineral] Collection: Mineral Collector 2, p. 4-5, 27-28, 36-37, 77-78, 89-90, 1895. An account of the collection and some of the techniques used in gathering it are given.
2. Corundum [Chester County]: Mineral Collector 4, p. 113-115, 1897. This is a popular account of the occurrence of corundum in many localities; most is from Chester County.

3. Clinochlore [Chester County]. Mineral Collector 12, p. 113-114, illus., 1905. A popular description of the mineral from its only known locality, 4 miles south of West Chester is given. Few details are included.

PENROSE, RICHARD ALEXANDER FULLERTON, JR.

1. Memoir of Persifor Frazer [Jr.] [1844-1909]: Geol. Soc. Amer., Bull. 21, p. 5-12, port., 1910.
2. Memorial of Amos P[easlee] Brown [1864-1917]: Geol. Soc. Amer., Bull. 29, p. 13-17, port., 1918.

PENTZ, H. H. See Ewing, William Maurice, 1.

PEPPER, JAMES FRANKLIN

1. (and Demarest, David F.). Map of the Berea sand of . . . southwestern Pennsylvania, shows thickness of sand and oil and gas pools in the sand: U.S. Geol. Survey, Oil and Gas Inv. Prelim. Map 29, cross section and text, scale, 1 inch to 3 miles, 1945. An isopach map of the Berea sand with the oil and gas fields located on it is given. The cross sections show it to be correlated with the lower part of the Pocono sandstone elsewhere in the Commonwealth. The origin and distribution of the sand are discussed.
2. (and others). [Map of the] Berea and Murrysville sands of . . . southwestern Pennsylvania, shows thickness of the sands and oil and gas pools in the sands: U.S. Geol. Survey, Oil and Gas Inv. Prelim. Map 89, geol. map with text, scale, about 1 inch to 3 miles, revised by D. F. Demarest and W. deWitt, Jr., 1948.

PETER, ROBERT, 1805-1894.

1. Obituary notice of the late principal geologist of Kentucky, David Dale Owen, M. D., [1807-1860]: Ky. Geol. Survey, Rpt. 4, p. 323-330, 1861.

PETERSEN, RICHARD G.

1. (and Skinner, W. S.). Probable fault east of Camelhump, Northampton County, Pennsylvania: S.R. thesis, Lehigh Univ., 1947.
2. A section of the Allentown formation near Freemansburg [Northampton County], Pennsylvania, with descriptions of the oolite beds: M.S. thesis, Lehigh Univ., 1948.

PETERSON, OLOF AUGUST

1. The fossils of the Frankstown cave, Blair County, Pennsylvania: Carnegie Museum, Annals 16, p. 249-314, illus., 1926. Three amphibians, three reptiles, two birds, and twenty-seven mammals are described in detail from a Pleistocene cave.

PHALEN, WILLIAM CLIFTON

1. (and Martin, Lawrence). Clays and shales of southwestern Cambria County, Pa.: U.S. Geol. Survey, Bull. 315, p. 344-354, 1907. Flint clay, plastic clay, fire clay, and shales are described from the Pennsylvanian rocks of the region. Various deposits are described.
2. Coal resources of Johnstown, Pa., and vicinity [Cambria, Somerset, Indiana, and Westmoreland Counties]: U.S. Geol. Survey, Bull. 316, p. 20-41, illus., 1907. Pennsylvanian stratigraphy is briefly outlined. The coals are described in detail. Analyses are made.
3. Description of the Johnstown quadrangle [Somerset, Westmoreland, Indiana, and Cambria Counties], Pa.: U.S. Geol. Survey, Geol. Atlas of U.S. folio 174, 15 p., illus. incl. geol. maps, 1910. A complete geologic description of the area is given. Devonian-Pennsylvanian rocks are mapped. Broad folds characterize the structure. Sections are measured; analyses are made. Coal is the chief mineral resource; clay, shale, stone, cement, and iron ore are also present.
4. (and Martin, Lawrence). Mineral resources of Johnstown, Pennsylvania and vicinity [Cambria, Somerset, Indiana, and Westmoreland Counties]: U. S. Geol. Survey, Bull. 447, 142 p., illus., 1911. Devonian-Pennsylvanian rocks are described in detail. The structure consists of gentle folds. Coal is the chief mineral resource. The coals are described in detail. Clay, shale, limestone, stone, sand, and iron ore are also mentioned. These are relatively minor.
5. Prospecting for chromium ore: Mining Science Press 105, p. 400-401, 1912. A very brief resumé of the chromium deposits of the world includes those deposits in the Commonwealth.

6. Salt resources of the United States: U.S. Geol. Survey, Bull. 669, 284 p., illus., 1919. Besides being in Allegheny County oil-field brines, rock salt of possible Salina equivalent has appeared in two wells in McKean County and Washington County.

PHEMISTER, THOMAS CRAWFORD

1. A note on the Lancaster Gap mine, [Lancaster County] Pennsylvania: Jour. Geology 32, p. 498-510, illus., 1924. Mica schist is the country rock. The ore is associated with an amphibolite which has intruded the schist. The ore occurs at the contact mostly. The metal minerals occur as irregular masses and veins; very few or none are primary igneous minerals. The mineralization is secondarily the result of fluids entering cracks and forming biotite; later, ore fluids replaced the biotite with the sulphides of nickel.

PHILBRICK, SHAILER SHAW

1. (and Nesbitt, Robert H.). Foundation and slope problems at Youghiogheny Dam [Fayette County] [abs.]: Economic Geology 36, p. 842, 1941.
2. Relationship of cyclothems to dam design [abs.]: Geol. Soc. Amer., Bull. 58, p. 1217-1218, 1947.

PHILLIPI, PAUL M. See Torrey, Paul Dwight, 3.

PHILLIPS, FRANCIS C.

1. The chemical composition of natural gas: Pa. Geol. Survey 2nd, Ann. Rpt. 1886, Part 2, p. 787-827, 1887. A discussion of the techniques involved and the results of analyses of natural gas from various parts of Pennsylvania are given.

PIERCE, JAMES

1. . . . mountain districts of Pennsylvania and the mineral resources of that state . . .: Amer. Jour. Sci. 12, p. 54-74, 1827. The anthracite region is described physiographically, socially, and economically. The bituminous area is described in less detail. Saline springs are described also.

PIERCE, WILLIAM GAMEWELL

1. (and Hanna, Jane, and Aberdeen, Esther Jane). [Map of] Oil and gas fields of the United States: Scale, 1:2,500,000 (1 inch equals 40 miles), U. S. Geol. Survey, 1943.

PILSBRY, H. A. See Wanner, Henry E., 2.

PIPER, ARTHUR MAINE

1. Ground water in southwestern Pennsylvania, with analyses by M. D. Foster and C. S. Howard: Pa. Geol. Survey 4th ser., W 1, viii, 406 p., illus. incl. geol. map, 1933. Upper Devonian-Permian, Pleistocene, and Recent formations are present. Each is described with emphasis on its water-bearing properties. Each county is described and the water-bearing rocks are discussed.

PIRSON, SYLVAIN JOSEPH

1. (and Bacon, Lloyal Orrin). Airborne magnetometer survey in [Centre-Clearfield Counties] central Pennsylvania: Pa. State College Mineral Industry Experiment Sta., Bull. 48, p. 55-65, illus., 1948. An anomaly-bearing map is interpreted so that the basement is folded up in the anticlines. The magnetic axes and geologic trends agree for the most part, but in some areas they do not. The deviations are interpreted as being caused by intrusions during the folding. The sediments thicken southeastward. Other features are also described.

PIRSSON, LOUIS VALENTINE, 1860-1919.

1. Pennine [Lancaster County], [Part] 4 *of* Mineralogical notes: Amer. Jour. Sci. 3rd ser. 42, p. 405-410, illus., 1891; Zeitschrift fur Krystallogaphie 22, p. 520-523, 1891. Crystals of pennine from the Wood mine are described and illustrated.
2. Israel Cook Russell [1851-1906]: Amer. Jour. Sci. 4th ser. 21, p. 481, 1906.
3. Samuel Lewis Penfield [1856-1906]: Amer. Jour. Sci. 4th ser. 22, p. 353-367, port., 1906.
4. Angelo Heilprin [1852-1907]: Amer. Jour. Sci. 4th ser. 24, p. 284, 1907.
5. Biographical memoir of James Dwight Dana, 1813-1895: Natl. Acad. Sci., Biog. Mem. 9, p. 41-92, port., 1919.

PLANK, WILLIAM B.

1. (and Fay, Albert H.). Influence of rock structure on blasting [Northampton County]: Amer. Inst. Mining and Metallurgical Engineers, Tech. Pub. 600,

13 p., illus., 1935. Fault planes and joints are shown to control rock slippage during blasting for a tunnel and road cut.

PLATT, FRANKLIN, 1844-1900. See also Ashburner, Charles Albert, 17; Sherwood, Andrew, 1.

1. Report of progress in the Clearfield and Jefferson district of the bituminous coal-fields of western Pennsylvania: Pa. Geol. Survey 2nd, H. viii, p. 1-246, illus. [incl. Centre County map], 1875. Coals of the Allegheny Formation are described in detail. The structure conveniently separates the coal regions into basins (synclines) with anticlines between them. Fire clay and iron ore are also present in small amounts. Sections are measured; analyses are made.
2. Durability of the natural gas supply: Pa. Geol. Survey 2nd, L, p. 161-172, 1876. Well logs are presented of oil wells which produced gas instead. Lithologic control of gas is discussed. The lithology of the Pottsville Formation is given as an example.
3. Special report on the coke manufacture of the Youghiogheny River valley in Fayette and Westmoreland Co., with geological notes of the coal and iron beds: Pa. Geol. Survey 2nd, L, vii, 252 p., illus., 1876. Included is a description of the coal-bearing rocks of the area. Sections are measured; fossils are listed; analyses are made. Iron ore beds occur in the [Pennsylvanian] and [Mississippian] rocks.
4. (and Platt, William Greenough). Report of progress in the Cambria and Somerset district of the bituminous coal-fields of western Pennsylvania—Part 1, Cambria [County]: Pa. Geol. Survey 2nd, HH, xxx, 194 p., illus. incl. atlas, 1877;—Part 2, Somerset [County]: HHH, xxxiv, 348 p., illus. incl. atlas, 1877. A description of the [Pennsylvanian] rocks and coal is given. Certain special structures are also described. Sections are measured and correlated; analyses are made. Coal, iron, limestone, and natural gas are the chief economic products.
5. Coal basins of Bradford and Tioga Counties, and at the forks of Pine Creek in Potter Co.—Part 2 *of* Report of progress in Bradford and Tioga Counties: Pa. Geol. Survey 2nd, G, p. 97-234, illus., [1878]. The Barclay basin in Bradford County has Allegheny Formation rocks in it, as well as two important coal beds. Iron ore is also described. The Blossburg basin in Tioga County is also described. Several coals in the Allegheny Formation are mentioned. Iron ore is also present. The Gaines basin in Tioga and Potter Counties also contains several Allegheny coal beds. Sections are measured in all the basins.
6. (and Sanders, Richard H.). Section of the Paleozoic rocks in Blair Co.: Amer. Phil. Soc., Proc. 17, p. 349-352, 714, 1878; Pa. Geol. Survey 2nd, F, p. 261-264, 1878. A detailed measured section [Pennsylvanian] rocks to possibly [Cambrian] rocks is given.
7. Character of some Sullivan Co. coals: Amer. Phil. Soc., Proc. 17, p. 186-191, 1879. Thirteen coals, semi-bituminous to bituminous, are analyzed. They carry an unusually large amount of moisture; all resorb 60 percent of the water quickly. No other Pennsylvania coals do this.
8. The Coudersport [Potter County] coal basin: Pa. Geol. Survey 2nd, GGG, p. 73-78, illus., 1880. Coal is mined from a small area within the Pottsville Formation. A subdivision of Pottsville rocks is given.
9. [The geology of] Sullivan County: Pa. Geol. Survey 2nd, GG, p. 161-247, illus. incl. geol. map, 1880. A complete geologic description of the area is given. [Devonian]-[Pennsylvanian] rocks are present. Anticlines and synclines make up the structure. Much emphasis is placed on the coal, which is the chief economic resource. Sections are measured.
10. The Hebron anticlinal and the Oswayo synclinal in Potter County: Pa. Geol. Survey 2nd, GGG, p. 79-82, 1880. Chemung rocks are at the axis of the anticline. They occur as limestones in the red Catskill beds. The syncline has Pottsville boulders at its axis; some are *in situ;* a glacial or colluvial origin is considered for the other boulders.
11. The Oleona coal basin [Potter County]: Pa. Geol. Survey 2nd, GGG, p. 69-71, 1880. A small area of coal in the Pottsville Formation has been preserved in

an area otherwise strongly eroded. The Pottsville Formation is estimated to be 80 feet thick; the Mauch Chunk Formation is very thin, and the Pocono Formation is about 130 feet thick. The coal is not economic.

12. The Pine Creek coal basin [Potter County]: Pa. Geol. Survey 2nd, GGG, p. 83-95, illus., 1880. This basin is the westward extension of the Gaines coal basin in Tioga County. A coal bed in the Pottsville Formation is described. Coal streaks are described from the Pocono Formation.
13. The Queen's Run coal basin in Clinton County, north of the Susquehanna River: Pa. Geol. Survey 2nd, G4, p. 153-164, illus., 1880. Coal and fire clay in the Pottsville Formation are described in detail. Their distribution is sporadic, and may be due to faulting. Sections are measured; analyses are made.
14. The Tangascootac coal basin in Centre and Clinton Counties, south of the Susquehanna: Pa. Geol. Survey 2nd, G4, p. 165-174, illus., 1880. Coal beds just above the Pottsville Formation are described. A fire clay is present but has never been worked. Sections are measured; analyses are made.
15. The geology of Blair County: Pa. Geol. Survey 2nd, T, vii, 311 p., illus. incl. atlas, 1881. A complete geological description of the area is presented. [Cambrian]-[Pennsylvanian] rocks are present. Folds and faults are evident. Sections are measured; fossils are listed, and analyses are made. Coal, iron, lead, and zinc are the main economic resources.
16. (and Sanders, Richard H., and Ashburner, Charles Albert, and others). Central and south-eastern Pennsylvania: Pa. Geol. Survey 2nd, Grand Atlas, Div. 5, Part 1, 1885. Thirty-five sheets include 29 maps relating to the topography and geology of the Paleozoic strata in parts of Cambria, Blair, Bedford, Huntingdon, Mifflin, Centre, and Union Counties. Some about Lancaster County and the Philadelphia area also are present. Most are published elsewhere in the county reports.

PLATT, WILLIAM GREENOUGH. See also Platt, Franklin, 4.

1. Report of progress in Indiana County: Pa. Geol. Survey 2nd, HHHH, xvi, 316 p., illus. incl. geol. map, 1878. A cursory geologic description of the area is given. [Devonian]-[Pennsylvanian] rocks are mapped. The coal-basin structures are described. Much emphasis is given to descriptions of coal-bearing formations.
2. Report of progress in Armstrong County: Pa. Geol. Survey 2nd, H5, lxvii, 388 p., illus. incl. geol. map, 1879. A complete geologic description of the area is giveu. Only [Pennsylvanian] rocks are present. The structure (anticlines and synclines) is considered in detail. Coal, limestone, fire clay, salt, and sandstone are the chief economic products. Sections are measured; analyses are made.
3. Report of progress in Jefferson County: Pa. Geol. Survey 2nd, H6, xxxiv, 218 p., illus. incl. geol. map, 1881. A complete geologic description of the area is given. [Mississippian]-[Pennsylvanian] rocks are present. The structure (anticlines and synclines) is described in detail. Sections are measured; analyses are made. Coal is the only mineral resource discussed.

PLOGER, LOUIS WILLIAM

1. Memorial of Thomas Cramer Hopkins [1861-1935]: Geol. Soc. Amer., Proc. 1935, p. 255-261, port., 1936.

PLOTTS, WILLIAM

1. Origin of petroleum, coal, etc. . . .: 29 p., [priv. pub.] Whittier, Calif., 1905. Examples are taken from the Commonwealth to show that coal and petroleum form at certain levels in the earth regardless of structure and other factors.
2. Isogeotherm hypothesis of mineral occurrence and origin. Origin of coal and other carbonaceous products . . .: 68 p., [priv. pub.], Whittier, Calif., 1911. Examples are taken from the Commonwealth and elsewhere to show that coal and oil form at points of equal temperatures regardless of structure and other factors.

POMEROY, SAMUEL WYLLYS

1. Remarks on the coal region between Cumberland and Pittsburgh: Amer. Jour. Sci. 21, p. 342-347, 1832. A generalized, popular account of the coals in southwestern Pennsylvania is given. No details are included.

PORTER, JACOB

1. Miscellaneous localities of minerals [Luzerne County]: Amer. Jour. Sci. 8, p. 233, 1824. There is a brief mention that limpid quartz is found on Broad Mt. No other location or details are given.

POSNJAK, EUGEN

1. (and Merwin, H. E.). Hydrated ferric oxides [Northampton County]: Amer. Jour. Sci. 4th ser. 47, p. 311-348, 1919. A specimen of lepidocrocite is described optically and by D. T. A.; it is compared with many other iron oxide varieties from elsewhere.

POSTEL, ALBERT WILLIAMS

1. Alteration of hornblende gneiss by granitic solutions in the Philadelphia [Chester County] area: Pa. Acad. Sci., Proc. 12, p. 114-119, illus., 1938. Hornblende gneiss inclusions in granodiorite are altered from the outer edge inward and are unaltered in the center. The percentage of biotite, epidote, and quartz increases outward; the plagioclase becomes sodic outward. Myrmekites are common at the contact.
2. Granitic rocks of the Philadelphia area [Philadelphia-Delaware Counties] [abs.]: Geol. Soc. Amer., Bull. 51, p. 2004-2005, 1940.
3. Folding and faulting in the Springfield [Delaware County] aplitic granodiorite: Pa. Acad. Sci., Proc. 15, p. 115-118, illus., 1941. The aplite dike is described megascopically and microscopically in detail. The faulting and folding took place while the rock was viscous, because gray and white aplite are interlayered and folded.
4. Hydrothermal emplacement of granodiorite near Philadelphia [Chester-Delaware Counties]: Acad. Nat. Sci. Phila., Proc. 92, p. 123-152, illus., 1941. Petrographic and field evidence is presented to show that the Springfield granodiorite is a hydrothermal replacement of previously metamorphosed and faulted schist. The source of the fluids is not exposed.
5. (and Adelheim, William). The type locality of the Wissahickon formation [Philadelphia County]: Pa. Acad. Sci., Proc. 17, p. 41-47, illus., 1943. A field and microscopic investigation is made. The sequence of events recognized is: (1) the sedimentary rocks were deposited, (2) metamorphism, followed by ultrabasic intrusion, (3) renewed deformation, and (4) hydrothermal pneumatolytic activity.
6. (and Adelheim, William). White mica in the Wissahickon complex [Philadelphia County]: Amer. Mineralogist 29, p. 279-290, illus., 1944. X-ray and optical examinations of a white mica mineral show it to be unusual. It occurs in the Wissahickon schist and in a granitic body in the schist. The mica has a complex metamorphic origin.

POSTLEY, OLIVE CLARA, 1882-1941. See also Mendenhall, William Curran, 3; Richardson, George Burr, 6, 10.

1. Natural gas developments and possibilities east of the main oil and gas field of Appalachian region: Amer. Assoc. Petroleum Geologists, Bull. 19, p. 853-875, illus., 1935. This is a resumé of exploration experiences, listed by county. Various fields and dry wells are discussed, always in connection with the carbon-ratio theory of White. All are west of the Allegheny structural front.
2. Bibliography of geologic structure maps and cross sections of areas in oil and gas states east of the Mississippi River . . .: Amer. Assoc. Petroleum Geologists, Bull. 22, p. 431-482, 1938. A list of maps is given by county in the western half of the Commonwealth.

POWELL, JOHN WESLEY, 1834-1902.

1. Physiographic regions of the United States: Natl. Geog. Soc., Mon. 3, p. 65-100, illus. [1895]; *in* Physiography of the United States: p. 65-100, illus., Natl. Geog. Soc., New York, 1896. A general discussion of the nation includes the Commonwealth.
2. James Dwight Dana [1813-1895]: Science ns 3, p. 181-185, 1896.

PRATT, JOSEPH HYDE

1. The occurrence and distribution of corundum in the United States [Delaware-Chester Counties]: U.S. Geol. Survey, Bull. 180, 98 p., 1901; revised, Bull. 269, 175 p., illus., 1906. A complete discussion of corundum includes the occurrence in Chester and Delaware Counties. It is here commonly associated

with plagioclase and with serpentine. Tourmaline and spinel are also associated with it.

PRATT, WALLACE EVERETTE

1. Frederick Gardner Clapp [1879-1944]: Economic Geology 39, p. 248-249, 1944.

PRESTON, FRANK W.

1. (and Henderson, Edward Porter, and Randolph, James Richardson). The Chicora (Butler County, Pa.) meteorite: U.S. Natl. Museum, Proc. 90. p. 387-416, illus., 1941. A very detailed account of a fall in 1938 is given. It is analyzed completely.
2. The glacial foreland [Butler County]: Ruffed Grouse 2, p. 6-17, illus., 1948. A popular account of the physiography in the great bend between the Allegheny and Ohio Rivers is given. The effects of glaciation are considered. The drainage changes are illustrated.

PRESTON, SAMUEL

1. Hypothesis on the formation of the Water Gap in a letter to the editor, *in* The register of Pennsylvania 1, By S. Hazard: p. 424, Philadelphia, 1828. "Believes that Kittatinny Mt. once formed a dam that held back water to form a large lake on the north side. "It appears that the dam must have been sunk into some very tremendous subterranean cavern, and to a depth that cannot be known or estimated."—B. L. Miller.

PRICE, JOHN WILLIAM

1. A new locality for calcareous concretions [Lancaster County]: Pa. Acad. Sci., Proc. 22, p. 135-137, 1948. Concretions with a variety of nuclei are reported from a stream which flows over much exposed limestone and which contains much blue-green algae. The algae cause the precipitation of calcium carbonate in quiet water.

PRICE. PAUL HOLLAND

1. The Appalachian structural front: Jour. Geology 39, p. 24-44, illus., 1931. Cross sections across the front, including the Commonwealth, show the several ways in which it could have formed. The structural break closely parallels the axis of the trough of deposition from at least Silurian-Early Pennsylvanian time. The type of failure was governed by the shape of the basin, the lithology, and the stratigraphy. In the Commonwealth, there are thrust faults separating the folds from the flat-lying plateau rocks.
2. Clay dikes in Redstone coal, West Virginia and [Fayette County] Pennsylvania: Amer. Assoc. Petroleum Geologists, Bull. 17, p. 1527-1533, illus., 1933. When coal has plastic clay directly above or below and is compressed, the clay will be forced into the joints in the coal. Such fissure fillings are described and illustrated.
3. (and Wells, Dana). Mastodon *(Mammut americanum)* remains in river gravels at Point Marion [Fayette County], Pa.: W. Va. Acad. Sci., Proc. 6, p. 81-84, illus., 1933; W. Va. Univ. Bull., ser. 33, no. 15, 1935. Teeth and a bone are described and illustrated from the Monongahela River gravels just below the Cheat River junction. They are probably Pleistocene in age.
4. James Donaldson Sisler [1896-1935]: Amer. Assoc. Petroleum Geologists, Bull. 19, p. 1717-1718, 1935.
5. (and Headlee, Alvah John Washington). Regional variations in composition of natural gas in Appalachian province: Amer. Assoc. Petroleum Geologists, Bull. 22. p. 1153-1183, illus. incl. geol. maps, 1938. A study of gas composition with its relation to petroleum suggests that it can be used as a prospecting tool. The regional variations are discussed in relation to structure, sedimentation, and regional metamorphism.
6. (and Headlee, Alvah John Washington). Geochemistry of natural gas in Appalachian province: Amer. Assoc. Petroleum Geologists. Bull. 26. p. 19-35, illus., 1942. Well-to-well variations in gas composition in individual fields are given. Definite relationships occur between gas composition and existence, and to petroleum. The origin, migration, and natural storage of gas and oil are discussed. The Commonwealth is included.

PRIME, FREDERICK, JR.

1. On the occurrence of the brown hematite deposits of the Great Valley [Lehigh County]: Amer. Inst. Mining Engineers, Trans. 3, p. 410-417, 1875: dis-

cussions by P. Frazer, Jr. and T. S. Hunt, p. 417-422; Amer. Jour Sci. 3rd ser. 9, p. 433-440, 1875; Engineering and Mining Jour. 20, p. 285-287, 1875. [Limonite] has formed as a result of ground water not being able to pass downward through schist. It deposited its iron content in the decomposed limestones. The iron came from pyrite in the limestone.

2. Report of progress on the brown hematite ore ranges of Lehigh Co.: Pa. Geol. Survey 2nd, D, ix, 73 p., illus., 1875. [Limonite] occurs in residual clay of the Cambro-Ordovician limestones of the county. Analyses are made; sections are measured; deposits are described.
3. On the discovery of Lower Silurian fossils in limestone associated with hydromica slates and on other points in the geology of Lehigh and Northampton Cos., eastern Pa.: Amer. Jour. Sci. 3rd ser. 15, p. 261-269, 1878; reprinted with title, On the Paleozoic rocks of Lehigh and Northampton Cos., Pa.: Amer. Phil. Soc., Proc. 17, p. 248-254, 1878; discussion by P. Frazer, Jr., p. 255-258, 1878. Rocks from Cambrian to [Ordovician] age are described. They are: [Hardyston quartzite], hydromica slates and [Cambro-Ordovician limestone], Trenton limestone, and the [Martinsburg shale]. Fossils are listed from the Trenton limestone. Frazer discusses limonite occurrences.
4. The brown hematite deposits of the Siluro-Cambrian limestones of Lehigh Co. . . .: Pa. Geol. Survey 2nd, DD, xi, 99 p., illus. incl. geol. maps, 1878. This is a continuation of the 1875 report. It contains descriptions of the [Precambrian] and lower Paleozoic rocks of the county. Individual iron mines are described; analyses are made, and sections are measured.
5. Moraines and surface drift deposits of Northampton Co., Pa.: Amer. Phil. Soc., Proc. 18, p. 84-85, 1879. The terminal moraine can be traced across most of the county. It has been eroded away between Wind Gap and the Lehigh River. It is redeposited farther south at Bethlehem and Easton. Another moraine occurs south of the main one. No glacial action is reported on the Reading Prong.
6. The limestone region, *in* Geology of Lehigh and Northampton Counties, by J. P. Lesley: Pa. Geol. Survey 2nd, D3, Part 1, p. 161-203, 1883. The Cambro-[Ordovician] limestones of the [Great Valley] are described in detail. Fossils are listed; analyses are made. The residual limonite ore bodies are also described.
7. The Potsdam sandstone, *in* Geology of Lehigh and Northampton Counties, by J. P. Lesley: Pa. Geol. Survey 2nd, D3, Part 1, p. 205-214, illus., 1883. The [Hardyston] sandstone is described in detail. Its origin is considered.
8. The coals of the United States: U.S. 10th Census 15, p. 605-617, illus., 1886. A geographic and generalized stratigraphic resumé of the coal fields of the United States including the Commonwealth, with no new geological data, is given.

PROSSER, A. G.

1. Notes on the new mines of Somerset County: Pa. Geol. Survey 2nd, HHH atlas, p. 397-404, 1877 [1899?]. This is a generalized description of coal beds exposed in mines. All are in the Salisbury basin. Fire clay is present in some. Sections are described.

PROSSER, CHARLES SMITH, 1860-1916.

1. The geological position of the Catskill group: Amer. Geologist 7, p. 351-366, 1891. Based primarily on paleobotanical evidence, the Catskill Formation is considered a part of the Lower Carboniferous [Mississippian]. References to the Commonwealth are made; fossils are listed.
2. The Devonian system of [Monroe County] eastern Pennsylvania: Amer. Jour. Sci. 3rd ser. 44, p. 210-221, illus., 1892. The Devonian section is described, and the fossils are listed. It is compared with the similar section in New York.
3. The Devonian system of eastern Pennsylvania and New York: U.S. Geol. Survey, Bull. 120, 81 p., illus., 1895. Devonian sections are measured and faunas are listed from Carbon, Monroe, Pike, and Wayne Counties.
4. The Devonian and Mississippian formations of northeastern Ohio: Ohio Geol. Survey 4th ser., Bull. 15, 574 p., illus., 1912. Parts of Crawford County are included. Detailed Devonian-Mississippian sections are measured and correlated. Fossils are illustrated.

PROTZELLER, RAYMOND J. See Lowall, Charles E., 1.

PROUTY, CHILTON E.

1. Lower Middle Ordovician: Ph.D. thesis, Columbia Univ., 1948.
2. Results of studies of Ordovician rocks east of Allegheny Front in Pennsylvania [abs.]: Amer. Assoc. Petroleum Geologists, Bull. 32, p. 2161, 1948.

PROUTY, WILLIAM FREDERICK

1. Serpentine marble deposits of the Maryland-[Lancaster County] Pennsylvania area [abs.]: Elisha Mitchell Sci. Soc., Jour. 46, p. 18-19, 1930.

PUTNAM, BAYARD T.

1. Notes on the iron ores of Pennsylvania: U.S. 10th Census 15, p. 179-221, illus., 1886. Magnetite, hematite, limonite, and siderite are sources of iron ore in the Commonwealth. Each type is reviewed and analyses are made of many samples from many places.

PUSEY, LEWIS B. See Richardson, George Burr, 6.

RAFINESQUE, CONSTANTINE SCHMALTZ, 1783-1840.

1. [Notice sur les fossiles de la vallée Sherman [Perry County] des monts Allegheny]: Soc. géol. France, Bull. 10, p. 381-382. Paris, 1939. [Devonian] [brachiopods] are mentioned as being present. No descriptions or details are included.

RAMMELSBERG, KARL FREDERICK

1. Untersuchung nordamerikanischen Mineralien (Nemalit, Orthit, schawarzes Kupferoxyd): Annalen Physik u Chemie 80 [3rd ser. 20], p. 284-287, Leipzig, 1850. An impure orthoclase from East Bradford in Chester County turns out to be allanite when analyzed.
2. Analyse der Glimmer von Utö und Easton [Northampton County] und Bemerkungen über die Zusammensetzung der Kaliglimmer überhaupt: Deutsche geol. Gesell., Zeitschr. 18, p. 807-812, Berlin, 1866. Some micas are compared for iron and potash content. They are analyzed and described; one is from Easton.

RAMSAY, GEORGE S.

1. The northeastern bituminous coal measures of the Appalachian system: Amer. Inst. Mining Engineers, Trans. 25, p. 76-83, 1896. A generalized review of the [Pennsylvanian] rocks and the coals in the region is given.

RAND, THEODORE DEHON, 1836-1903. See also Hall, Charles Edward, 6, 7,; Koenig, George Augustus, 4; Lesley, J. Peter, 41.

1. [A recent disturbance in Cambrian sandstone near Philadelphia, Philadelphia County.]: Acad. Nat. Sci. Phila., Proc. [22] 1870, p. 134, 1870. Fresh, sharp breaks in the rock exposed in a quarry suggest very recent faulting. The lower beds are almost vertical and the upper beds are horizontal or have a slight dip.
2. Note on occurrence of goslarite at Freidensville [Lehigh County], Pennsylvania [abs.]: Franklin Inst., Jour. 3rd ser. 64, p. 154, 1872.
3. Notes on feldspar and some other minerals of Philadelphia [Philadelphia County] and vicinity: Acad. Nat. Sci. Phila., Proc. [24] 1871, p. 299-304, 1872. Orthoclase, oligoclase, sunstone, cassinite, and lennilite are the varieties of feldspar described. Also mentioned are localities for apophyllite, steatite, serpentine, and hisingerite. Analyses of many are given.
4. On the rocks near Philadelphia [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [29] 1877, p. 251-254, 1877. Rocks are described and their minerals are given. The locations are accurately determined. No attempt is made at stratigraphic determination. They include varieties of mica schist, gneiss, granitic veins, granite, soapstone, serpentine, and diabase. The superposition of the streams is mentioned.
5. On a belt of serpentine and steatite in Radnor Township, Delaware Co., Pa.: Acad. Nat. Sci. Phila., Proc. [30] 1878, p. 402-404, 1879; addition with title, The northern belt of serpentine in Radnor Township: Proc. [32] 1880, p. 295, 1881. Serpentine and steatite are described petrologically and geographically. The outcrops appear to be on a NE-SW line and a fault connection is postulated.
6. A new locality for gypsum [Delaware County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 253, 1881. Gypsum occurs as an efflorescence on gneiss in a quarry near Darby.

7. A new locality for millerite [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 243, 1881. Millerite is in dolomite from a soapstone quarry near the Schuylkill River. It occurs as crystals in cavities in the dolomite.
8. Change of serpentine into quartz [Delaware County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 241-242, 1881; Mineralogy and Geol. Sec., Proc. no. 1, p. 5-6, 1881. A quarry near Radnor has serpentine associated with a rock locally called ironstone. The ironstone is cellular quartz, however. It is a result of the decomposition of the serpentine, leaving an iron-stained cellular-quartz mass as residue.
9. Chromite near Radnor [Delaware County], Pa.: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 273, 1881. Chromite occurs "in considerable quantity" in the Southern Serpentine Belt, near Radnor Station. No details are given.
10. On a peculiar stratification in gneiss [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 280-281, 1881; Mineralogy and Geol. Sec., Proc. no. 1, p. 44-45, 1881. A railroad cut has exposed a gneissic area previously considered as diabase. Horizontal stratification is present in an area which is elsewhere violently contorted.
11. Potsdam sandstone near King of Prussia [Montgomery County]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 279, 1881; Mineralogy and Geol. Sec., Proc. no. 1, p. 43, 1881; discussion with title, A Potsdam sandstone outcrop on the S. Valley hill of Chester Valley, by H. C. Lewis: Proc. [32] 1880, p. 329, 1881. A mention is made of the presence of [Lower Cambrian] sandstone in the South Valley Hills. Lewis shows it to be an L-shaped outcrop, probably faulted at both ends. Since the North Valley Hills [Cambrian] have sandstones dipping north, the presence of the same rock on the South Valley Hills suggest that an anticline is present.
12. Serpentine belts in Radnor Township, Delaware Co., Pa.: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 225-226, 1881. The middle serpentine belt consists of altered [Martinsburg] shales and is not a continuous belt, but is *en echelon* from NE to SW, striking E-W. These directions are similar to the diabase dikes to the north of the serpentine belts.
13. Some microscopic enclosures in mica [Chester-Delaware Counties]: Acad. Nat. Sci. Phila., Proc. [32] 1880, p. 276-277, 1881; Mineralogy and Geol. Sec., Proc. no. 1, p. 40-41, 1881. Mica crystals contain magnetite dendrites and a variety of crystal shapes of other uncertain minerals. Quartz crystals are also included.
14. New locality for mountain cork [Delaware County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 56, 1883. [Asbestos] is reported in the soil over serpentine west of Radnor Station.
15. Notes on the Lafayette [Delaware County] serpentine belt: Acad. Nat. Sci. Phila., Proc. [37] 1885, p. 407, 1886. The locating of an outcrop on the Roberts Road indicates that the Lafayette serpentine belt is continuous and has a change in strike.
16. Notes on the geology of Radnor Township [and vicinity] in Delaware Co., Pa.: Pa. Geol. Survey 2nd, Ann. Rpt. 1886, Part 4, p. 1569-1618, illus. incl. geol. map, 1877. The geology of this area is considered in detail. [Precambrian]-Triassic rocks are present, overlain by late Tertiary gravel. Sections are measured. Serpentine and steatite belts are evident.
17. A discussion of the rocks of Pennsylvania and New York: New York Acad. Sci., Trans. 8, p. 47-51, illus., 1889; discussion, p. 51-53. The structure of the [Piedmont] in Montgomery County is described. Overturned folds are common. [Precambrian] and [Cambro-Ordovician] metamorphic rocks are involved. A cross section is included.
18. Notes on the genesis and horizons of the serpentines of southeastern Pennsylvania: Acad. Nat. Sci. Phila., Proc. [42] 1890, p. 76-123, 1890. A petrologic and geographic description of the various serpentine bodies is given. It includes those near Easton A review of the literature is included. They are altered sediments, and are in four stratigraphic horizons.
19. Geology of the South (Chester) Valley Hill [Chester County]: Acad. Nat. Sci. Phila., Proc. [42] 1890, p. 435-436, 1891. [Wissahickon schist] is reported

from near West Chester. Previously, all the area had been considered to be underlain by [Baltimore] gneiss. The Wissahickon schist contains garnets; the Baltimore gneiss here is schistose, and otherwise greatly resembles the Wissahickon schist.

20. The sandstones of Chester Valley [Delaware County], Pa.: Acad. Nat. Sci. Phila., Proc. [43] 1891, p. 119-120, 1891. An exposure of micaceous sandstone [Chickies?] is described. The presence of [Cambrian] sandstone had not heretofore been suspected.
21. (and Jefferis, William W., and Cardeza, J. T. M.) Mineral localities of Philadelphia and vicinity [Philadelphia, Montgomery and Chester Counties]: Acad. Nat. Sci. Phila., Proc. [44] 1892, p. 174-202, 1892. This is a list of localities, mostly overrun by the urban increase, where minerals are to be found. Over 200 are listed.
22. The Sadsbury [Chester-Lancaster Counties] steatite: Acad. Nat Sci. Phila., Proc. [46] 1894, p. 455-460, 1895. A band of steatite is described petrologically and geographically. It is hard and compact when fresh but soft and sectile when weathered. In some cases it approaches pure talc. It is generally vuggy and talcose; it is generally gray or green. Locally it has serpentine with it. Pyrite and magnetite are present locally also.
23. The serpentines of eastern Pennsylvania: Acad. Nat. Sci. Phila., Proc. [48] 1896, p. 219, 1896. The origins of the serpentines are briefly discussed. The yellow serpentine from Easttown Township, Chester County, is altered crystotile; that from near Reading, Berks County, is unchanged bronzite. The Radnor serpentine is altered enstatite; some is asbestos.
24. Trap dikes in Chester Co., Pa.: Acad. Nat. Sci. Phila., Proc. [47] 1895, p. 540-541, 1896; discussion with title, Two supposed new trap dykes in Chester County, Pennsylvania, by P. Frazer, Jr.: Proc. [48] 1896, p. 206-207, 1896. Three dikes are located and described which had not been previously mapped. One, a prophyry, is near Aldham, the second near Downingtown, and the others are as small occurrences in Penn and Lower Oxford Townships. The latter are coarse-grained gabbro-phonolites.
25. Mica schists of the Schuylkill River [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [48] 1896, p. 484, 1897. Mica schist from Fairmount Park has nodules of quartz containing a little kyanite or sillimanite. The aggregate resembles andalusite crystals. Contact metamorphism of the included fragments is suggested.
26. The Birdsboro trap quarries [Berks County]: Acad. Nat. Sci. Phila., Proc. [50] 1898, p. 10, 1898. Quarries in the Triassic diabase show the rock to be highly jointed. Intense contact metamorphism is evident. In places it resembles the rock at French Creek. Laumontite and heulandite are present.
27. Notes on the geology of southeastern Pennsylvania: Acad. Nat. Sci. Phila., Proc. [52] 1900, p. 160-338, illus., 1900. A complete geologic description of the area southeast of the Triassic rocks is given. [Precambrian]-[Ordovician], sedimentary, and Triassic igneous rocks are present. Local structures are described.

RANDALL, F. A.

1. Observations of the geology around Warren [Warren County], Pa.: Pa. Geol. Survey 2nd, I, p. 50-54, illus., 1875. [Middle Devonian]-[Pennsylvanian] rocks are described. The fossils are listed. The strata are undeformed.
2. Warren County [fossil] collections, *in* Catalogue of the geological museum, Part 3: Pa. Geol. Survey 2nd, OOO, p. 25-32, 1889; correction by G. B. Simpson, p. 257-260. This is a list of specimens collected and mentioned in report I-4 of the Survey. No detailed localities are given.

RANDOLPH, JAMES RICHARDSON. See Preston, Frank W., 1.

RATH, GERHARD VON, 1830-1888.

1. Pennsylvanien: 155 p., Heidelberg, 1888. A complete description, geographical, geological, and social, is given. The topography and chief mineral resources are briefly reviewed. No details are included.

RAU, ALBERT G.

1. Glacial striae [Northampton County]: Science ns 6, p. 668, 1897. Glacial striae are reported from along the Delaware River four miles south of the [Wisconsin] moraine.

RAVITCH, R.

1. The Dove Lake area, near Haverford [Delaware County], Pennsylvania: S. P. thesis, Bryn Mawr College, 1944.

RAYBURN, J. M.

1. The deposit of double thick Upper Freeport coal situated in the valley of Allegheny River in Allegheny, Butler, and Westmoreland Counties, Pennsylvania: Engineers Soc. Western Pa., Proc. 40, p. 27-38, illus., 1924; discussions, p. 39-44. This unusually thick bed is described in detail, mostly from the mining point of view. Its origin is discussed.

RAYMOND, PERCY EDWARD. See also Willard, Bradford, 44,

1. Some sections of the Conemaugh series between Pittsburgh [Allegheny County] and Latrobe [Westmoreland County], Pennsylvania: Carnegie Museum, Annals 5, p. 166-177, illus., 1909. Sections are measured, and fossils are listed from railroad cuts. Correlations are attempted.
2. On the discovery of reptilian remains in the Pennsylvanian near Pittsburgh [Allegheny County], Pa.: Science ns 26, p. 835-836, 1907. Thereomorph reptile bones come from the Pittsburgh red shales directly under the Ames limestone. They are well-preserved fragments. They resemble *Eryops* and a reptile of the family Diadectidae.
3. Notice of two new horizons for marine fossils in [south] western Pennsylvania: Science ns 29, p. 940-941, 1909. Three locations are given for collecting Pennsylvanian marine fossils in limestone. They are: (1) Wood's Run area, Allegheny County, (2) near Duchesne, and (3) Riverview Park, Kennywood Park, both near Duchesne, and at (4) Glassport, Wilmerdung, and East Pittsburgh.
4. A preliminary list of the fauna of the Allegheny and Conemaugh series in western Pennsylvania: Carnegie Museum, Annals 7, p. 144-158, illus., 1910; Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1908-10, p. 81-98, illus., 1911. Faunal lists from different outcrops are analyzed. The Vanport limestone is the only marine-fossil-bearing Allegheny Formation member. There are many horizons in the Conemaugh Formation. The more characteristic ones are illustrated.
5. Notes on Ordovician trilobites—[Part] 2, Asaphidae from the Beekmantown [Centre County]: Carnegie Museum, Annals 7, p. 35-45, illus., 1910. *Hemigyraspis colliena* is illustrated and described along with many others from elsewhere.
6. (and Narraway, J. E.). Notes on Ordovician trilobites—[Part] 3, Asaphidae from the Lowville and Black River [Blair County]: Carnegie Museum, Annals 7, p. 46-59, illus., 1910. *Onchometopus simplex* from Franklin Forge is illustrated and described.
7. Sketch of the local geology, city of Pittsburgh [Allegheny County] [abs.]: Geol. Soc. Amer., Bull. 22, p. 721, 1911; discussion by E. W. Shaw, p. 721-722.
8. Some trilobites of the lower middle Ordovician of eastern North America: Harvard Coll. Mus. Comp. Zool., Bull. 67, p. 1-180, illus., 1925. *Lonchodomas sublaevis* and *Homotelus elongatus* from the Chambersburg limestone in Cumberland County are described and illustrated.

RAYMOND, ROSSITER WORTHINGTON, 1840-1918. See also Blandy, John F., 1.

1. Biographical notice of John F. Blandy [1833-1903]: Amer. Inst. Mining Engineers, Trans. 34, p. 740-742, 1904.
2. Biographical notice of William Phipps Blake [1826-1910]: Amer. Inst. Mining Engineers, Bull. 45, p. 749-762, port., 1910; Trans. 41, p. 851-864, port., 1911.
3. Memoir of William Phipps Blake [1826-1910]: Geol. Soc. Amer., Bull. 22, p. 36-47, port., 1911.

READ, CHARLES BRIAN. See also White, Charles David, 14.

1. A Pennsylvanian florule from the Forkston coal in the Dutch Mountain outlier [Wyoming County], northeastern Pennsylvania: U.S. Geol. Survey, Prof. Paper 210-B, ii, p. 17-28, illus., 1946. Seven genera and seven species of plants are described and illustrated from the shale above the Forkston coal. They are near the base of the section in the Northern anthracite field and are absent in the Southern. They resemble those of Pottsville Formation.

2. Pennsylvanian floral zones and floral provinces, *in* Symposium on Pennsylvanian problems, by H. R. Wanless: Jour. Geology 55, p. 271-279, 1947. Arcto-Carboniferous floral zones are compared to the Antarcto-Carboniferous floral zones. When ecology is considered, the mid-continent area was somewhat different from the Appalachian area.

REED, DONALD F.

1. Investigation of the Albright Farm lead-zinc deposit, Blair County, Pa.: U.S. Bur. Mines, Rpt. Inv. 4422, 7 p. (#), illus., 1949. Galena and sphalerite in barite and dolomite gangue are found in Ordovician limestone. Many veins occur. Cores are logged.
2. Investigation of Pickering Creek lead-zinc deposits, Chester County, Pa.: U.S. Bur. Mines, Rpt. Inv. 4451, 11 p. (#), illus., 1949. Galena and sphalerite occur in veins which are probably differentiates of the diabase of Triassic age. Cores are logged.

REEDS, CHESTER ALBERT

1. James Furman Kemp, 1859-1926: Natural History 27, p. 105-107, port., 1927.

REESE, JOHN F.

1. Bituminous coal reserves in Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 54, 9 p. (#) 1922. Tables show reserves by county and by individual coal seam. Almost 44 billion tons remain, and only 5 billion have been removed.
2. Coal reserves in Allegheny County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 31, 5 p. (#), 1922. Three economic coal beds contain over 1 billion tons of reserves.
3. Coal reserves in Armstrong County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 39, 5 p. (#), 1922. Six economic coal beds still contain over 2 billion tons of reserves.
4. Coal reserves in Cambria County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 44, 5 p. (#), 1922. Six beds are mined from the Allegheny Formation, and over 3 billion tons are yet to be mined.
5. Coal reserves in Clearfield County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 53, 6 p. (#), 1922. Six beds of economic importance are present in the Allegheny and Conemaugh Formations. Each is described. Reserves are estimated at over 2 billion tons.
6. Coal reserves in Fayette County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 33, 5 p. (#), 1922. Seven coal beds of economic importance are considered. Reserves of over 2 billion tons are estimated.
7. Coal reserves in Greene County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 25, 6 p. (#), 1922. Five beds of economic importance contain over 7 billion tons of reserves.
8. Coal reserves in Indiana County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 37, 5 p. (#), 1922. Four main coal beds, the two Freeports, Lower Kittanning, and Pittsburgh, have in reserve over 4 billion tons.
9. Coal reserves in Somerset County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 43, 12 p. (#), 1922. Nine beds in the Allegheny Formation are considered. Almost 4 billion tons are available.
10. Coal reserves in Washington County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 27, 6 p. (#), 1922. Five beds of economic significance contain over 5 billion tons of reserves.
11. Coal reserves in Westmoreland County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 35, 5 p. (#), 1922. Six economic coal beds in the Allegheny Formation are described. The reserves are over 3 billion tons.
12. (and Sisler, James Donaldson). Coal resources—Part 3 *of* Bituminous coal fields of Pennsylvania, Introductory volume: Pa. Geol. Survey 4th ser., M 6, vi, 153 p., illus., 1928. The method by which coal reserves are calculated is described. The reserves of every township of every county are calculated and listed. The main producing beds in each county are given.

REESIDE, JOHN BERNARD, JR.

1. The Helderberg limestone of central Pennsylvania: U.S. Geol. Survey, Prof. Paper 108, p. 185-225, illus., 1917. The Helderberg group is studied and correlated throughout the Commonwealth. Individual sections are described; fossils are listed.

2. [Edward Oscar Ulrich, 1857-1944]: Wash. Acad. Sci., Jour. 34, p. 168, 1944.

REEVES, FRANK

1. The absence of water in certain sandstones of the Appalachian oil fields: Economic Geology 12, p. 354-378, illus., 1917. The sands of the Catskill Formation contain no connate water whereas those of the overlying Mississippian rocks do. The sediments were dried out before burial, and the trapped air prevented meteoric water from entering. The climate was semi-arid which produced the surrounding red beds.

REEVES, JOHN ROBERT

1. Hebron gas field, Potter County, Pennsylvania: Amer. Assoc. Petroleum Geologists, Bull. 20, p. 1019-1027, illus., 1936. This gas field is producing from the Oriskany sandstone on the Hebron anticline. The Devonian section is discussed, and the field is outlined by contours.
2. (and Davies, Nathan C.). Subsurface distribution of Hamilton group of New York and [Bradford County] northern Pennsylvania: Amer. Assoc. Petroleum Geologists, Bull. 21, p. 311-316, illus., 1937. Over 100 wells were examined. The Hamilton group is like a wedge. The thickness increases to over 2000 feet in Pennsylvania from 200 feet in New York. The rate of thickening also increases southward. The Marcellus Formation is the most easily recognized unit.

REGER, DAVID BRIGHT. See also Morganroth, L. C., 2.

1. Pocono stratigraphy in the Broadtop Basin of [Huntingdon, Bedford, and Fulton Counties] Pennsylvania: Geol. Soc. Amer., Bull. 38, p. 397-410, 1927. Sections are measured and correlated; fossils are listed. The Pocono group is about 1000 feet thick, and contains the fossiliferous Riddlesburg shale near the bottom.
2. Gravity of oils in the Appalachian Province, *in* Problems of petroleum geology: p. 101-107, illus., Amer. Assoc. Petroleum Geologists, (Powers Mem. vol.), Tulsa, 1934. Production in the Appalachians is commonly controlled by nonporosity or sand absence rather than by water. The gravity of oil in the Paleozoic beds is higher than in younger sands elsewhere. Sand-oil is paraffin base and higher gravity than the limestone-oil which is asphalt base. There is a relation between age and structure to gravity also.

REICKEN, LAURA E. See Robinson, William Orrin, 1.

REINHOLD, ELI S. See also Genth, Frederick Augustus, 13.

1. A new locality for copiapite [Schuylkill County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 60, 1882. This mineral is reported from Mahanoy City. No details are given.
2. Pyrophyllite and alunogen in coal mines [Schuylkill County]: Acad. Nat. Sci. Phila., Proc. [34] 1882, p. 55-56, 1882; Mineralogy and Geol. Sec., Proc. no. 2, p. 22-23, 1882. Efflorescent alunogen occurs as coating on mine washings. Ordinarily it results from the sulphur in mine-water uniting with alumina in shale. Here the alumina comes from decomposing pyrophyllite because alunogen only occurs where pyrophyllite is present.

REMICK, D. B.

1. A study of the producing formations in the oil fields of the United States east of the Rocky Mountains: M.S. thesis, Univ. Texas, 1942.

RENICK, B. COLEMAN

1. The correlation of the Allegheny-Pottsville section in western Pennsylvania: Jour. Geology 32, p. 64-80, illus., 1924; abstract with discussion by G. H. Ashley: Geol. Soc. Amer., Bull. 34, p. 68-70, 1923. The Foxburg-Clarion folio is in error. The Pottsville Series should include the Clarion Formation, and the Clarion sandstone is at the top of the Pottsville Series in the Allegheny River section. The Craigsville coal is the equivalent of the Brookville coal. Sections are measured.

REPUBLIC EXPLORATION COMPANY

1. [Map of] Major geologic features of the United States: Scale, 1:4,500,000 (1 inch equals 70 miles), oil and gas ed. (#), [Tulsa, 1941?].

RESSER, CHARLES ELMER, 1889-1943.

1. Preliminary generalized Cambrian time scale: Geol. Soc. Amer., Bull. 44, p. 735-756, illus., 1933. The Cambrian of the Commonwealth is included in a

general discussion of the Cambrian of the world. The Lower Cambrian lies below the *Paradoxides* zone. The Middle Cambrian coincides with the *Paradoxides* zone, and the Upper Cambrian is above the *Paradoxides* zone and below the Tremodocian Series. None of the type areas are in Pennsylvania.

2. Cambrian system (restricted) of the southern Appalachians: Geol. Soc. Amer., Special Paper 15, vii, 140 p., illus., 1938. The various Cambrian formations are described and correlated. Fossils are listed and illustrated. The Commonwealth is included.
3. (and Howell, Benjamin Franklin). Lower Cambrian *Olenellus* zone of the Appalachians: Geol. Soc. Amer., Bull. 49, p. 195-248, illus., 1938. Lower Cambrian statigraphy and fauna of the Appalachians are discussed, and considerable attention is paid to Lancaster and York Counties. Fossils from all the formations are listed, but an exhaustive study of the fauna of the Kinzers shale is included.

RHOADS, SAMUEL N.

1. Distribution of the American bison in Pennsylvania, with remarks on a new fossil species [Bucks County]: Acad. Nat. Sci. Phila., Proc. [37] 1895, p. 244-248, 1895. A resumé of bison-bone reports is given. *Bison appalachicolus* is described as new from Durham Cave, Bucks County. It is post-Pliocene.

RICE, WILLIAM NORTH

1. James Dwight Dana, geologist, 1813-1895, *in* Leading American men of science, by D. S. Jordan, ed.: p. 233-268, port., Holt and Co., New York, 1910.
2. The geology of James Dwight Dana, [1813-1895], *in* Problems of American Geology: p. 1-42, port., Yale Univ., New Haven, 1915.

RICH, JOHN LYON

1. Identification and interpretation of erosion surfaces in the Allegheny Plateau [abs.]: Geol. Soc. Amer., Bull. 50, p. 1987-1988, 1939.
2. Memorial to Nevin M[elancthon] Fenneman [1865-1945]: Assoc. Amer. Geog., Annals 35, p. 181-189, port., 1945.

RICHARDS, HORACE GARDINER

1. The subway tree—a record of a Pleistocene cypress swamp in Philadelphia [Philadelphia County]: Bartonia 13 1931, p. 1-6, illus., 1932. A cypress, *Taxodium distichum*, is described and illustrated from Pleistocene swamp beds well below sea level.
2. Fossil mollusks from the Triassic of [Chester County] Pennsylvania. Pa. Acad. Sci., Proc. 18, p. 69-72, illus., 1944; Acad. Nat. Sci. Phila., Notulae Naturae 206, 4 p., illus., 1948. *Diplodon yorkensis* is illustrated from Chester County. A review of previous mollusk finds is given.

RICHARDS, W. B.

1. Geology of the Panther Creek Valley [Schuylkill-Carbon Counties], Pa.: Coal Age 3, p. 722-727, illus., 1913. The geology of the region is described. Pennsylvanian rocks and coal are described in detail. A cross section shows the structure.

RICHARDSON, EUGENE STANLEY, JR. See also Swartz, Frank McKim, 14.

1. A middle Ordovician and some lower Devonian conularids, with two orthoceratids from Central Pennsylvania: M. S. thesis, Penn State College, 1942.

RICHARDSON, GEORGE BURR, 1872-1949.

1. The misnamed Indiana [Indiana County] anticline: Jour. Geolgy 10, p. 700-702, illus., 1902. The Fayette anticline plunges northeastward, and along its axis extension the Richmond anticline occurs, but it plunges southwestward. Previous workers considered them continuous and noted the Indiana anticline between them. Actually, the Latrobe syncline is present instead.
2. Description of the Indiana quadrangle [Indiana County]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 102, 7 p., illus. incl. geol. maps, 1904. A complete geologic description of the area is given. Mississippian-Pennsylvanian rocks are mapped. Devonian rocks are known from wells. Broad folds comprise the structure. Sections are measured. Coal, gas, clay, and stone are the mineral resources discussed.
3. Note on Appalachian oil-field brines [Butler-Washington Counties]: Economic Geology 12, p. 39-41, 1917. Analyses are made of two oil field brines. The unusually high salinity precludes connate water in the original sense. It is

due to rock salt leaching and diffusion which led to subsequent concentration in the petroleum traps.

4. Note on the diffusion of sodium choride in Appalachian oil-field waters: Wash. Acad. Sci., Jour. 7, p. 73-75, 1917. The water in the oil wells of western Pennsylvania is unusually high in salt content. Leaching of underlying salt beds and diffusion is suggested as the cause.
5. Oil and gas fields of Pennsylvania: Map, scale, 1:500,000, U.S. Geol. Survey, 1921.
6. (and Heald, Kenneth C., and Pusey, Lewis B.). [Map of] oil and gas fields of the United States, 4 sheets: Scale, 1:2,500,000, 1 inch equals 40 miles, U. S. Geol. Survey, 1922; also 1932 edition; also (and Postley, Olive Clara, and Hanna, Jane), 1940.
7. Structure-contour maps of the Pittsburgh-Huntington basin: Geol. Soc. Amer., Bull. 39, p. 543-553, illus., 1928. A series of structure contour maps at various levels are interpreted. The basin is spoon-shaped and compressed from east to west. The axis through the lower part of the basin extends NE-SW. Numerous minor folds and cross structures are present. There is a suggestion that the structures of Devonian rocks do not conform to surface rock (Pennsylvanian) structure, but this is not conclusive.
8. Structure of the Pittsburgh basin [abs.]: Geol. Soc. Amer., Bull. 39, p. 188, 1928; Pan-Amer. Geologist 49, p. 143, 1928.
9. Geology and coal, oil, and gas resources of the New Kensington quadrangle [Allegheny, Butler, and Westmoreland Counties], Pennsylvania: U. S. Geol. Survey, Bull. 828, v, 102 p., illus. incl. geol. map, 1932. A complete geologic description of the area is given. Pennsylvanian and Pleistocene rocks are mapped. Sections are measured; fossils are listed. The structure consists of gentle folds. Coal, and oil and gas are the mineral resources that are described. Well records are included.
10. (and Postley, Olive Clara, and Hanna, Jane). [Map of] oil and gas fields of the United States: Scale, 1:2,500,000 (1 inch equals 40 miles), U. S. Geol. Survey, 1932; revised, 1940.
11. Description of the Somerset and Windber quandrangles [Somerset, Bedford, Westmoreland, and Cambria Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 224, 14 p., illus. incl. geol. maps, 1934. A complete geologic description of the area is given. Devonian-Pennsylvanian rocks are mapped. The rocks are flat lying for the most part. Sections are measured; fossils are listed; analyses are made. Coal is the chief mineral resource. Gas, clay, iron ore, sandstone and limestone are also present.
12. Geology and mineral resources of the Butler and Zelienople quadrangles [Beaver, Butler, and Lawrence Counties], Pennsylvania: U. S. Geol. Survey, Bull. 873, v, 93 p., illus. incl. geol. maps, 1936. A complete geologic description of the area is given. Pennsylvanian rocks and Pleistocene sediments are mapped. The structure consists of gentle folds. Sections are measured; fossils are listed. Coal, oil and gas (Devonian), shale, clay, sandstone, sand and gravel, limestone, and iron ore are the mineral resources. Analyses are made; well records are included.
13. Marius Robinson Campbell (1858-1940): Amer. Assoc. Petroleum Geologists, Bull. 25, p. 546-550, port., 1941.

RICKARD, THOMAS ARTHUR

1. James Furman Kemp [1859-1926], in memoriam: Engineering and Mining Jour. 123, p. 32-33, port., 1927.

RIDGWAY, THOMAS S.

1. Physical features of the siliceous conglomerate rock and Carboniferous limestone along the eastern outcrop of the coal formation of the United States: Mining and Statistics Mag. 11, p. 253-254, New York, 1858 [not seen].
2. Report on the oil district of Oil Creek in the State of Pennsylvania: Franklin Inst., Jour. 85 [3rd ser. 45], p. 269-273, illus., 1863. A general discussion of the [Devonian] stratigraphy and the petroleum production in northwestern Pennsylvania is given.

RIES, HEINRICH

1. The clays of the United States east of the Mississippi River: U. S. Geol. Survey, Prof. Paper 11, 293 p., illus., 1903. A complete description of the

various kinds of clay includes many from the Commonwealth. Residual clay, fire clay, shales, kaolin, glacial clay, and alluvial clay deposits are described. Sections are measured.

2. Clays, their occurrence, properties, and uses . . .: xvi, 490 p., illus., Wiley, New York, 1906; 2nd ed., xix, 554 p., illus., 1912; 3rd ed., xx, 613 p., illus., 1927. In a treatise on clays, many examples are used from the Commonwealth.
3. The occurrence of high-grade American clays and the possibility of their further development: Amer. Ceramic Soc., Jour. 1, p. 446-467, illus., 1918. A general review of clay occurrences includes a brief mention of the clays in the Commonwealth. It occurs as pegmatite-weathering products and as limestone residuum.
4. High-grade clays of the United States [abs.]: Geol. Soc. Amer., Bull. 30, p. 95-96, 1919.
5. (and Bayley, W. S., and others). High-grade clays of the eastern United States . . .: U. S. Geol. Survey, Bull. 708, 314 p., illus., 1922. Kaolin once came from pegmatites of Delaware County. Kaolin now comes from Cambrian schists in several counties. Various deposits are described; they are residual. It also occurs as a residual deposit in shale and limestone of the Oriskany Formation.

RIGNEY, HAROLD WILLIAM

1. The Middle Mississippian formations of North America. M. S. thesis, Univ. Chicago, 1933.

RITTENHOUSE, GORDON

1. Map showing the distribution of several types of Berea sand in . . . western Pennsylvania: U. S. Geol. Survey, Oil and Gas Inv. Prelim. Map 58, includes text, scale, 1 inch equals 16 miles, 1946. The Berea Formation of western Pennsylvania is in a petrographic province which indicates a northern source. The rock is described petrographically in detail, and Mississippian paleogeography is considered.
2. (and Cather, Margaret Elaine). The texture of Mississippian, Upper Devonian, and Lower Pennsylvanian sandstones in the Appalachian Basin: U. S. Geol. Survey, [Misc. Pubs. on mineral resources] 35 p. (#), 1946; addition with title, The texture of Paleozoic sandstones and sandy limestones in the Appalachian Basin: 13 p. (#), 1946. Statistics and textural data of over 600 samples are given. The data are presented in tables with no attempt at interpretation. Silurian-Pennsylvanian rocks are included.
3. Early Silurian rocks of the northern Appalachian Basin: U. S. Geol. Survey, Oil and Gas Inv. Prelim. Map 100, includes text, Scale, 1 inch equals 40 miles, 1949. The northwestern portion of the Commonwealth is included. Sections show how the eastern clastic units intertongue with limestone formations to the west. The work is mostly done on subsurface information. Isopach maps show the relationships of the various intertonguing units. The paleogeography is considered.
4. Petrology and paleogeography of the Greenbrier formation [southwestern Pa.]: Amer. Assoc. Petroleum Geologists, Bull. 33, p. 1704-1730, illus., 1949. While the article deals mostly with West Virginia, Pennsylvania is mentioned. The formation is studied from well samples, insoluble residues, heavy minerals, and thin sections. It rests unconformably on Lower Mississippian Burgoon sandstone. It thickens southwestward.
5. Sedimentary facies in early Silurian rocks of northern Appalachian Basin [abs.]: Oil and Gas Jour. 47, no. 46, p. 154, 1949.
6 The distribution and thickness of the Queenston shale in the northern Appalachian basin: Producers Monthly 13, no. 5, p. 29-30, illus., 1949. An isopach map shows the Upper Ordovician Queenston shale to thin toward the east. It is about 1000 feet thick in western Pennsylvania.

ROBINSON, CLAIR WILLARD

1. (and Krynine, Paul Dimitri). A new mastodon location at Saltillo, Huntingdon County, Pa.: Pa. Acad. Sci., Proc. 12, p. 93-96, illus., 1938; Pa. State College Mineral Industry Experiment Sta., Tech. Paper 51, 1940. A tusk, three teeth, and fragments of a jaw bone of a mastodon are reported from a swamp. The animal was originally trapped in the swamp where it was found.

ROBINSON, H. H. See Barrell, Joseph, 8.
ROBINSON, J. FRENCH. See also Ashley, George Hall, 29.

1. Gas wells on Nine Mile Run, Pittsburgh [Allegheny County], Penna.: Pa. Topog. Geol. Survey [4th ser.], Bull. 11, 2 p. (#), 1920. Wells on the Amity anticline are in the Hundred-foot sand. The structure is described.
2. Gas wells on Pollock Run, Westmoreland County, Pensylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 12, 2 p. (#), 1920. Wells in the Big Injun (Mississippian) and Speechley (Devonian) sands outline the Bellevernon anticline.
3. Scenery Hill gas field, Washington County, Pa. *in* Structure of typical American oil fields 2: p. 443-450, illus., Amer. Assoc. Petroleum Geologists, Tulsa, 1929. Gas occurs in domes on a plunging anticline in Devonian rocks. The stratigraphy is listed and the structure is shown on a map.
4. Stratigraphy of southwestern Pennsylvania: Engineers Soc. Western Pa., Proc. 46, p. 133-138, illus., 1930. Many cross sections illustrate Devonian-Pennsylvanian correlations. Special emphasis is put on the possible oil-bearing sands.
5. Recent gas developments in northern Pennsylvania and southern New York: Engineers Soc. Western Pa., Proc. 48, p. 81-98, illus., 1932; discussions, p. 99-102. A review of the Devonian stratigraphy and a discussion of gas wells and structures in the northern tier are given. The Oriskany sandstone is the big producing horizon. Well logs are included.
6. (and Jones, Verner Everett, and Gaddess, Jack). Subsurface structural geology of the [Tioga-Potter Counties] northern Pennsylvania and southern New York gas fields.: Pa. State College Mineral Industry Experiment Sta., Bull. 11, p. 9-18, illus., 1932. The Tioga field is compared to others; it is on an asymmetrical anticline with the south flank the steeper. It has faults in the subsurface which appear to be the result of underthrusting. The folds and faults become more intense with depth. The energy was probably in the basement and was reflected in the sedimentary rocks above.

ROBINSON, SAMUEL

1. A catalogue of American minerals with their localities . . .: 316 p., Boston, 1825. Minerals are listed from the United States, including the Commonwealth. They are catalogued by locality. No details are given, however.

ROBINSON, WILLIAM C.

1. Analysis of spessartite garnets [Philadelphia-Delaware Counties]: Jour. Analyt. Chem. 1, p. 251, 1887. Garnets from Fairmount Park in Philadelphia and from near Avondale are described physically and chemically.

ROBINSON, WILLIAM ORRIN

1. (and Lakin, Hubert William, and Reichen, Laura E.). The zinc content of plants on the Friedensville [Lehigh County] zinc slime ponds in relation to biogeochemical prospecting: Economic Geology 42, p. 572-582, 1947. The zinc content of 30 different plants growing near the slime pond was determined. Certain plants assimilate zinc much more than others. The prospecting application is considered.

RODDY, HARRY JUSTIN

1. The Lower Cambrian of Lancaster County, Pa. [abs.]: Science ns 30, p. 415, 1909.
2. Concretions in streams formed by the agency of blue green algae and related plants [Lancaster County]: Amer. Phil. Soc., Proc. 54, p. 246-258, illus., 1915. Concretions between one and ten inches in diameter are described. Some have stony nuclei and are caused by the precipitation of calcium carbonate by blue-green algae around a nucleus.
3. Physical and industrial geography of Lancaster County, Pennsylvania: vi, 113 p., illus., New Era Printing Co., Lancaster, 1916. A detailed physiographic review is given. The climate, topography, and origin of the relief are also discussed.
4. Problems of calcareous concretions in streams [abs.]: Pa. Acad. Sci., Proc. 1, p. 76, 1926.

RODGERS, JOHN

1. Evolution of thought on structure of middle and southern Appalachians: Amer. Assoc. Petroleum Geologists, Bull. 33, p. 1643-1654, illus., 1949. This is

a historical account of the changing ideas about the nature of Appalachian folding. Much original work was done in the Commonwealth. It includes the Rodgers brothers, Maclure, Emmons, Vanuxem, Hall, Safford, Lesley, Butts, and many others.

ROEDDER, EDWIN WOODS. See Brown, Edwin Augustus, 1.

ROEDER, JOSEPH HARRISON

1. The symmetry of the folding of the Broad Top synclinorium [Huntingdon County]: M.S. thesis, Univ. Pittsburgh, 1949.

ROGERS, AUSTIN F.

1. Cerussite crystals from Phoenixville [Chester County], Pa.,—[Part] 6 *of* Mineralogical notes, no. 3: Columbia Univ., School of Mines Quarterly 23, p. 133-139, 1902. Crystallographic data are given.

ROGERS, EMMA

1. Life and letters of William Barton Rogers [1804-1882], edited by his wife: 2 vols., 427, 451 p., port., Boston, 1896.

ROGERS, HENRY DARWIN, 1808-1866. See also Lea, Isaac, 4; Lesquereux, Leo, 1; Rogers, William Barton, 2.

1. First annual report of the state geologist: 22 p., Harrisburg, 1836. A generalized view is given of the geology of the Commonwealth as known at that time. The various problems in mapping are anticipated. No details are included.
2. Second annual report on the [1st] geological exploration of the State of Pennsylvania: 93 p. (2nd ed. 91 p.), illus., Harrisburg, 1838; discussion with title, Notes on American geology, by T. A. Conrad: Amer. Jour. Sci. 35, p. 237-249, 1839; discussion by B. Silliman, p. 250-251. A brief discussion of the way in which the Survey is functioning is given. The formations of the Commonwealth are numbered in ascending stratigraphic order, as follows: I—[Cambrian] clastics; II—[Cambro-Ordovician] carbonates; III—[Martinsburg Formation]; IV—[Tuscarora] (Oneida) Formation; V—Upper [Silurian] shales and limestones; VI—[Helderberg] limestone; VII—[Oriskany] sandstone; VIII—Middle [Devonian] shale; IX—Upper [Devonian] shale; X—[Pocono] Formation; XI—[Mauch Chunk] shale; XII—[Pottsville] conglomerate; XIII—[Allegheny] Formation. Each is described from the eastern part of the Commonwealth.
3. Third annual report of the [1st] geological survey of the state of Pennsylvania: 119 p., (2nd ed. 118 p.), Harrisburg, 1839. A summary of the work accomplished during the year is given. The bulk of the report is stratigraphical, and in the form of a progress report. The western part of Pennsylvania has [Pennsylvanian] rocks exposed, which are described.
4. Fourth annual report of the [1st] geological survey of the state of Pennsylvania: 215 p., (2nd ed. 252 p.), Harrisburg, 1840. Various parts of the Commonwealth are considered, primarily from the economic mineral viewpoint; much structure and stratigraphy are also included. Iron ore, chromium, limestone, slate, and coal are the most abundant mineral resources. Analyses are made.
5. Fifth annual report of the [1st] geological exploration of the Commonwealth of Pennsylvania: 156 p., (2nd ed. 179 p.), illus., Harrisburg, 1841. Annual progress in various parts of the Commonwealth is described. The stratigraphy, structure, and economic geology are described in detail. Sections are measured; analyses are made.
6. [Origin of overturned folds in Pennsylvania] [abs.]: Amer. Jour. Sci. 41, p. 177, 1841; Assoc. Amer. Geologists, Rpt., p. 29-30, 1843.
7. [Ground and polished surfaces at the contact of ancient secondary strata] [abs.]: Amer. Jour. Sci. 43, p. 181, 1842; Assoc. Amer. Geologists, Rpt., p. 73, 1843.
8. Sixth annual report of the [1st] geological survey of Pennsylvania: 28 p., Harrisburg, 1842. This report is in anticipation of the final report due much later and gives very little new information. The coal-bearing rocks are discussed. Special emphasis is on the stratigraphy in the bituminous areas. The final report is outlined cursorily.
9. [Striated surfaces in northeastern Pennsylvania and on the origin of conglomerate] [abs.]: Amer. Jour. Sci. 43, p. 180-181, 1842; Assoc. Amer. Geologists, Rpt. [Trans.], p. 72-73, 1843; Geologist 1843, p. 40, London, 1843.

10. An inquiry into the origin of the Appalachian coal strata, bituminous and anthracite: Assoc. Amer. Geologists, Rpt. [Trans.], p. 433-474, 1843. The extent, physical features, lithology, and origin of the [Pennsylvanian] rocks of the Appalachian coal basin are discussed. The origin of the coal is also considered. Most examples are taken from the Commonwealth.
11. On the direction of the slaty cleavages in strata of the southeastern belts of the Appalachian chain, and the parallelism of the cleavage dip with the planes of maximum temperature [abs.]: Assoc. Amer. Geologists, Proc. 6, p. 49-50, 1845.
12. On the geology of Pennsylvania [abs.]: British Assoc. Adv. Sci., Rpt. 18, p. sec. 74-75, London, 1849.
13. [Altered shale and sandstone from New Hope, Bucks County] [abs.]: Boston Soc. Nat. Hist., Proc. 3, p. 30, 1851.
14. On the coal formation of the United States and especially as developed in Pennsylvania: Amer. Assoc. Adv. Sci., Proc. 4, p. 65-70, 1851. A generalized discussion is given of: (1) the materials of the coal-bearing beds (origin, etc.), (2) the structure of the anthracite region, (3) the partial metamorphism of the strata, (4) the erosive action of Recent floods, and (5) statistics.
15. [The origin of New York and Pennsylvania beds of limestone]: Boston Soc. Nat. Hist., Proc. 3, p. 258-259, 1851. The limestones of the Commonwealth are considered to be littoral in origin; they grade westward into purer limestones in the Cincinnati area. Facies changes *per se* are not discussed.
16. Reports on Wheatley, Brookdale, and Charlestown mines, Phoenixville, Chester County, Pennsylvania: 40 p., T. K. and P. G. Collins Printers, Philadelphia, 1853; in part: Mining Mag. 1, p. 375-387, New York, 1853. Galena-bearing veins in [Precambrian] rocks are discussed. The ore is from dikes which are post-[Triassic]-diabase and pre-[Cretaceous] in age. Twenty-eight associated minerals are listed.
17. [Flexures in coal basins] [abs.]: Boston Soc. Nat. Hist., Proc. 4, p. 328, 1854.
18. The Lackawanna coal basin—its geology and mining resources around Scranton [Lackawanna County], Pa.: Mining Mag. 2, p. 388-395, 475-490, 609-620, New York, 1854. A detailed review of the [Pennsylvanian] stratigraphy and coal resources of the area is given. The coals are discussed in detail.
19. [Footprints and other impressions on Carboniferous red shale of Pennsylvania]: Boston Soc. Nat. Hist., Proc. 5, p. 182-185, 1856; discussions by J. C. Warren, W. B. Rogers, and C. T. Jackson, p. 185-186. No locations are given, but footprints from [Mauch Chunk] shale, attributed to reptiles, are described. "Fossil" rain drop impressions are also mentioned.
20. . . . Geological report [of the Trebarton coal fields, Northumberland County]: 35 p., G. S. Roe, New York, 1856. A description of the coal fields in the Zerbe's Run area southwest of Pottsville is given. Eleven coal beds are present. The four lower ones are in the Pottsville Formation and three of the seven in the overlying Allegheny Formation are of "colossal" dimensions. Analyses are given. Over 100 million tons of reserves are in the basin.
21. Classification of several types of orographic structures visible in the Appalachians and other undulated mountain chains, *in* Geology of Pennsylvania 2, by H. D. Rogers: 917-941, illus., Philadelphia, 1858. Topographic results of the erosion of various kinds of structurally distorted strata are shown, using examples from the Commonwealth.
22. Geological and topographical map of the anthracite fields of Pennsylvania: Scale, 1 inch equals about 2 miles, Harrisburg, Pa. Geol. Survey [1st], 1858.
23. Geological map of the State of Pennsylvania: Scale, 1 inch equals 5 miles, Harrisburg, Pa. Geol. Survey [1st], 1858.
24. Organic remains of the Paleozoic strata of Pennsylvania, *in* Geology of Pennsylvania 2, by H. D. Rogers: p. 815-834, illus., Philadelphia, 1858. Fossils from each of the major rock units are listed and illustrated. All of the major groups are included. Carboniferous plants are not included, however.
25. The geology of Pennsylvania, a government survey: 2 vols., xvii, 586 p., illus., xxiv, 815 p., illus., Philadelphia, 1858; portions reprinted in Pa. Geol. Survey 2nd. GGG, 1880; and H, 1879. This is a comprehensive geologic description of the Commonwealth. It is here that the names of the times of

the day are affixed to the Paleozoic strata. Each "age" is discussed geographically with its associated mineral wealth. Special emphasis is placed on the [Pennsylvnian]. The igneous and metamorphic rocks are described in detail, along with their associated economic products.

26. Classification of the metamorphic strata of the Atlantic slope of the Middle and Southern States: Boston Soc. Nat. Hist., Proc. 6, p. 140-145, 1859. Recognition of different ages for different kinds of [Precambrian] rocks is made. The [Precambrian]-[Paleozoic] contact is shown to be unconformable. *Scolithus* is listed as the earliest life. The rocks below the unconformity are called true [basement] gneissic series, those immediately above but fossilless are called Azoic, [Glenarm series], and the Paleozoic sequence begins with the *Scolithus*-bearing beds. They are described from many locations in the southeastern counties.
27. On the distribution and probable origin of the petroleum or rock oil of western Pennsylvania, New York, and Ohio: Phil. Soc. Glascow, Proc. 4, p. 355-359, 1860. A review of the geographic, stratigraphic, and physical nature of petroleum is given. Its relation to anticlines is noted.
28. On petroleum: Phil. Soc. Glascow, Proc. 6, p. 48-60, 1866. A review of the nature of petroleum and its occurrence in the Commonwealth is given. It is known from [Devonian] sandstones at a relatively shallow depth.

ROGERS, R. DOUGLAS, JR.

1. (and DeLong, Charles B.,). The Henry Shaler Williams geology camp [Huntingdon County]: Compass 18, p. 25-29, illus., 1937. A description of the geology in the vicinity of the field camp of Cornell University is given. Cambrian-Pennsylvanian rocks are present.

ROGERS, R. E.

1. [Magnesian limestones of Pennsylvanian] [abs.]: Amer. Jour. Sci. 41, p. 171, 1841; Assoc. Amer. Geologists, [Proc.] Rpt. 2nd sess., p. 24, 1843.

ROGERS, REGINALD D.

1. A petrographic study of the Bald Eagle, Juniata, and Tuscarora formations in central Pennsylvania: M.A. thesis, Cornell Univ., 1939.

ROGERS, ROBERT E. See Lesley, J. Peter, 4.

ROGERS, WILLIAM BARTON, 1804-1882. See also Rogers, Henry Darwin, 19.

1. [Erosion of strata underlying the Oriskany sandstone] [abs.]: Amer. Jour. Sci. 43, p. 181-182, 1842; Assoc. Amer. Geologists, Rpt., p. 73-74, 1843.
2. (and Rogers, Henry Darwin). On the physical structure of the Appalachian chain, as exemplifying the laws which regulated the elevation of great mountain chains generally: Assoc. Amer. Geologists, Rpt. [Trans.], p. 474-531, illus., 1843; reprinted *in* The Geology of the Virginias, by W. B. Rogers: p. 601-642, illus., New York, 1884. This is the classical paper on the origin of the Appalachian structures as a result of the [Appalachian Revolution] folding the [Paleozoic] rocks with forces from the southeast. The Commonwealth is included.
3. [Triassic lignite from Lancaster County] [abs.]: Boston Soc. Nat. Hist., Proc. 5, p. 189-190, 1856.
4. [The Clinton iron ores of the Appalachian belt] [abs.]: Boston Soc. Nat. Hist., Proc. 6, p. 340-341, 1859.
5. [The parallelism of the Lower Carboniferous of Pennsylvania and Virginia and of Nova Scotia and New Brunswick]: Boston Soc. Nat. Hist., Proc. 7, p. 170-173, 1859; discussions, p. 173-174. The [Mississippian] rocks of the Commonwealth are shown to be similar to those in eastern Canada by virtue of their stratigraphic position and lithologic succession.
6. [The group of rocks constituting the base of the Paleozoic series in the United States] [abs.]: Boston Soc. Nat. Hist., Proc. 7, p. 394-395, 1861.

ROLFE, DEETTE

1. Geologic influences in the economic development of the Pennsylvania Piedmont Plateau: Geog. Soc. Phila., Bull. 13, p. 133-154, illus., 1915. A semipopular account of the geology of the area to show its effects on soils and topography of the region is given.

ROMER, ALFRED SHERWOOD

1. (and Grove, Brandon H.). Environment of the early vertebrates: Amer. Midland Naturalist 16, p. 805-856, illus., 1935. In a general discussion, exam-

ples from the Silurian and Devonian rocks of the Commonwealth are considered. The paleoecology of the early fish is described.

2. Notes on branchiosaurs [Allegheny County]: Amer. Jour. Sci. 237, p. 748-761, illus., 1939. A small amphibian from a shale layer in the upper Conemaugh Formation is described in detail as *Branchiosaurus darrahi*. Related animals are discussed.

ROSE, G. See also Dana, James Dwight, 2.

1. Albitähnliches mineral aus [southeastern] Pennsylvanien, part 2 *of* Untersuchen über die chemische Zusammensetzung des Feldspaths und anderer vervandter Gattungen: Annalen Physik u Chemie 52 [2nd ser. 22], p. 465-474, Leipzig, 1841. An albite is described and analyzed. It came from the Commonwealth, but no details are included. [It probably comes from one of the southeastern counties, however].
2. [Brucite from Wood's mine, Lancaster County] [abs.]: Deutsche geol. Gesell., Zeitschr. 12, p. 178-179, Berlin, 1860.

ROSENFELD, MELVIN ARTHUR

1. Some aspects of porosity and cementation: Pa. State College Mineral Industry Experiment Sta., Bull. 52, p. 31-42, illus., 1949; Producers Monthly 13, no. 7, p. 39-42, illus., 1949. The Bradford Third and Venango sands are used as examples to show the dominating effect of cementation over other factors in determining porosity.

ROSENKRANS, ROBERT RUSSELL. See also Whitcomb, Lawrence, 5.

1. Correlation studies of the central and south-central Pennsylvania bentonite occurrence: M.S. thesis, Penn. State College, 1933; Amer. Jour. Sci. 5th ser. 27, p. 113-134, illus., 1934; discussion with title, Hiatus between the Lemont member of the Carlin limestone and the Lowville limestone in central Pennsylvania, by C. Butts, 28, p. 390, 1934. Bentonite beds occur in the Middle Ordovician limestones. Six of the beds can be traced over 110 miles. They are studied petrographically and stratigraphically. Sections are measured. The stratigraphy of the enclosing beds is considered also.
2. Stratigraphy of the Ordovician bentonite occurrences [abs.]: Geol. Soc. Amer., Proc. 1935, p. 99-100, 1936.
3. The role of bentonite correlation in stratigraphic studies of the Ordovician of eastern North America: Internatl. Geol. Cong., 16th U. S. 1933, Rpt. 2, p. 1085-1087, 1936. This is a generalized description of the value of bentonite in regional correlation. Examples are taken from the Commonwealth. No new details are given.

ROSS, CLARENCE SAMUEL. See also Wells, Roger Clark, 1.

1. Altered Paleozoic volcanic materials and their recognition: Amer. Assoc. Petroleum Geologists, Bull. 12, p. 143-164, illus., 1928. A review of bentonite occurences includes descriptions of that from Centre County.
2. Copper deposits in the eastern United States, *in* Copper resources of the world: p. 151-166, illus., Internatl. Geol. Cong., 16th, Washington, D. C., 1935. A very brief description of deposits and potentials is given. Copper in Pennsylvania is not commercial. It is known from the Catoctin belt near Maryland. It is also known from Devonian shale from Bedford County.
3. Sauconite, a clay mineral of the montmorillonite group [Lehigh County]: Amer. Mineralogist 31, p. 411-424, 1946. A complete description of the mineral is given; it is a zinc-bearing clay of the montmorillinite group.

ROSS, J. G. See Kemp, James Furman, 7.

ROSS, RALPH BURGESS

1. Structures in the Conemaugh formation near Bakerstown Station [Allegheny County], Pa. [abs.]: Pittsburgh Univ., Bull. 30, p. 509, 1933.

ROSS, WILLIAM ALEXANDER

1. The drift of the Wyoming Valley [Wyoming County]: B.S. thesis, Cornell Univ., 1898.

ROSS, W. G. See Shaw, Charles F., 1.

ROTHROCK, EDGAR PAUL

1. Freeman Ward (1879-1943): Amer. Assoc. Petroleum Geologists, Bull. 28, p. 692-693, 1944.

ROTHROCK, HOWARD EUGENE

1. Study of the Pennsylvania anthracite fields [abs.]: Geol. Soc. Amer., Bull. 60, p. 1973-1974, 1949.

ROTHWELL, RICHARD PENNEFATHER, 1836-1901.

1. [Sections in the anthracite fields, Carbon County]: Amer. Phil. Soc., Proc. 11, p. 113, illus., pl. 2, 1869. Cross sections of the anthracite basin near [Jim Thorpe] are presented to show the nature of the synclinorium.

ROY, ANDREW

1. The Allegheny coal field: Engineering and Mining Jour. 21, p. 442, 1876. An extremely brief resumé of the whole Appalachian coal area includes the Commonwealth.

RUEDEMANN, RUDOLPH. See also Clarke, John Mason, 4; Schuchert, Charles, 10.

1. *Camptostroma,* a Lower Cambrian floating hydrozoan [Lancaster County]: U. S. Natl. Museum, Proc. 82, art. 13, 8 p., illus., 1933. *Camptostroma roddyi* is described from Fruitville, Lancaster County.
2. Paleozoic plankton of North America: Geol. Soc. Amer., Mem. 2, 141 p., illus., 1934. *Caryocaris silicula,* a crustacean, is described from the Martinsburg shale in Franklin County, along with other planktonic forms from other areas.
3. (and Howell, Benjamin Franklin). Impression of a worm on the test of a Cambrian trilobite [Lancaster County]: Jour. Paleontology 18, p. 96, illus., 1944. A possible worm boring on the cheek of an *Olenellus* from the Kinzers shale is illustrated. No classification or name is given.
4. An Ordovician *Ceratiocaris* [Lehigh County]: Amer. Midland Naturalist 34, p. 547-548, illus., 1945. *Ceratiocaris willardi* is described from the Martinsburg shale.
5. Graptolites of North America: Geol. Soc. Amer., Mem. 19, x, 652 p., illus., 1947. A complete treatise on graptolites includes descriptions of those from the Commonwealth. Most are from Ordovician and Silurian rocks. Faunas are listed and illustrated.

RUSCHENBERGER, W. S. W.

1. A sketch of the life of Joseph Leidy [1823-1892]: Amer. Phil. Soc., Proc. 30, p. 135-184, 1892.

RUSSELL, GEORGE C., JR.

1. Hydrothermal alteration of a dike at Seisholtzville [Berks County], Pennsylvania: Pa. Acad. Sci., Proc. 15, p. 89-93, illus., 1941. An altered basic dike in the Precambrian rocks is analyzed and interpreted as Ordovician in age. It was probably originally andesite or diabase.

RUSSELL, ISRAEL COOK, 1852-1906.

1. Correlation papers—The Newark system: U. S. Geol. Survey, Bull. 85, 344 p., illus., 1892. These rocks in the United States and the Commonwealth are completely described and analyzed. The amphibians, reptiles, and plants are listed. The igneous rocks and the structural deformation are also described. An extensive bibliography is included. The age is concluded to be Upper Triassic.

RUTLEDGE, JOHN JOSEPH

1. The Clinton iron-ore deposits of Stone Valley, Huntingdon County, Pa.: Thesis, Johns Hopkins Univ., 1904; Amer. Inst. Mining Engineers, Bull. 24, p. 1057-1087, 1908; Trans. 40, p. 134-164, 1910; discussion by W. Kelly, Bull. 25, p. 107-108, 1909; Trans. 40, p. 854-855, 1910. Shales of all colors, and sandstone, are described. The [Keefer] sandstone is also described. Ore occurs as ferruginous limestone, sandstone cement, in oolites, and as concretions. It is often fossiliferous. The origin is due to replacement of limestone and to concentration by leaching.

RYAN, JOHN DONALD. See also Willard, Bradford, 65.

1. (and Willard, Bradford). Triassic footprints from Bucks County, Pennsylvania: Pa. Acad. Sci., Proc. 21, p. 91-93, illus., 1947. An amphibian track from *Kintneria brunswicki* is illustrated and described from the Brunswick shale.
2. The petrology of the diabase intrusions of the Delaware River valley: M.S. thesis, Lehigh Univ., 1948.

SADLER, JAMES WILLIAM

1. A study of the insoluble residues of the dolomites and limestones of the Canadian and Ozarkian Systems in central Pennsylvania: M.S. thesis, Cornell Univ., 1933.

SADTLER, BENJAMIN, JR.

1. Minerals from Fritz Island [Berks County], Pa.: Amer. Chemical Jour. 4, p. 356-357, 1883. Chabazite, mesolite, and apophyllite are described and analyzed.

SADTLER, S. P. See Day, David Talbot, 1; Genth, Frederick Augustus, 11.

SALISBURY, ROLLIN D., 1850-1922. See also Bascom, Florence, 9, 10; Wright, Albert Allen, 1; Wright, George Frederick, 9, 12.

1. Certain extramorainic drift phenomena of New Jersey [and eastern Pennsylvania]: Geol. Soc. Amer., Bull. 3, p. 173-182, 1892. Proof that glacial material exists south of the [Wisconsin] terminal moraine is presented. Previously the terminal moraine was thought to be the southern limit of the ice in the Commonwealth. Multiple glaciation in the Commonwealth is suggested.

SALISBURY, SAMUEL H., JR.

1. (and Beck, George C.). A study of the dolomitic limestones of the Allentown quadrangle [Lehigh-Northampton Counties]: Industrial and Engineering Chem., Jour. 6, p. 837-843, illus., 1914. The dolomites of Ordovician age are described and analyzed. They are considered to be primary because: (1) the magnesium content is constant, (2) limestone beds are intercalated, (3) few fossils are found, (4) oolites are in some of the layers, and (5) because contemporaneously precipitated silica is present.

[SAMPSON, EDWARD]

1. (and others). Old metal mines and Mine Ridge anticline [Lancaster County]: Field Conf. of Pa. Geologists, 15th, 9 p. (#), illus. [Lancaster], 1949. This is a guidebook and itinerary to the Wood mine, Peach Bottom slate area. and Gap nickel area. Details of areas are given on maps. No text is included.

SANDERS, RICHARD H. See also Lesley, J. Peter, 63; Platt, Franklin, 6, 16.

1. Geological map of Franklin County: Scale, 1 inch to 2 miles, Pa. Geol. Survey 2nd, D 5, 1881. [Precambrian]-Devonian rocks are mapped with the iron ore deposits included.
2. The slate region, *in* Geology of Lehigh and Northampton Counties, by J. P. Lesley: Pa. Geol. Survey 2d, D 3, Part 1, p. 83-148, illus., 1883. The slate in the [Martinsburg] Formation is described in detail. Individual outcrops, locations, and quarries are described. The structures are described also.

SANDERS, T. P.

1. Secondary fault found present in [Tioga County] Pennsylvania gas field: Oil and Gas Jour. 35, no. 21, p. 54, illus., 1936. A fault, repeating an anticlinal structure in the subsurface, is shown from well log interpretations.

SANFORD, ROBERT STILLSON. See also Burton, S. E., 1; Kerns, W. H., 1.

1. Investigation of certain high-alumina clays of central Pennsylvania: U. S. Bur. Mines, Rpt. Inv. 4427, [12 p.] (#), illus., 1949. Alumina-rich underclay occurs below some of the Lower Pennsylvanian coal beds. Some contain diaspore nodules. Few details are included.

SANFORD, SAMUEL

1. (and Stone, Ralph Walter and Schroder, Frank Charles). Useful minerals of the United States: U. S. Geol. Survey, Bull. 585, 250 p., 1914; revised, Bull. 624, 412 p., 1917. A list of economic deposits of the states includes the Commonwealth. The list is alphabetical and gives a very brief geographic location of all those mentioned.

SAVAGE, THOMAS EDMUND

1. Tentative correlation of the Pennsylvanian strata in the eastern interior, western interior, and Appalachian regions by their marine faunas [abs.]: Geol. Soc. Amer., Bull. 29, p. 97, 1918.
2. Sedimentary cycles in the Pennsylvanian strata: Amer. Jour. Sci. 5th ser. 20, p. 125-135, 1930. Evidence is presented to show that the Appalachian and Eastern Interior basins were not connected during the Pennsylvanian. The source, comparison, and type of sedimentary rocks are described. Unconformities are also considered as criteria for comparisons.

SAYLER, NELSON

1. Geological map of Ohio with the adjoining portions of Pennsylvania and West Virginia: Scale, 1 inch equals 15 miles, Cincinnati, 1865.

SAYLES, IRA

1. Oil region of [northwest] Pennsylvania [abs.]: Amer. Jour. Sci. 2nd ser. 39, p. 100-101, 1865.

SCHAEFFER, F. C.

1. Localities of minerals: Amer. Jour. Sci. 1, p. 236-237, 1819. Hematite, malachite, and quartz from the Perkiomen lead mines in Montgomery County, and magnesite from Philadelphia County are reported. No details are included.

SCHNEIDER, E. A. See Clarke, Frank Wigglesworth, 1, 2.

SCHOENFELD, J. See also Knerr, E. B., 1.

1. (and Smith, Edgar Fohs). Brucite [Berks County]: Amer. Chemical Jour. 5, p. 281, 1883; Zeitschrift fur Krystallographie 10, p. 400, Leipzig, 1883. The mineral from Fritz Island and from near Sinking Spring is analyzed.

SCHOEPF, JOHANN DAVID

1. Beytrage zur mineralogischen Kenntniss des östlichen Theils von Nordamerika und seiner Gebürge: 194 p., Erlangen, Germany, 1787. An account of travels in the United States includes Pennsylvania. It describes the Piedmont region and its associated rocks, the [Cambro-Ordovician] belt, the [South Mountain] belt, the [Great Valley], and the [Folded Mountains]. Fossils, wind, and water gaps are mentioned. It has only historical value, however, as no details are included.

SCHOPF, JAMES MORTON

1. (and Cross, Aureal Theophilus). A glacial-age peat deposit near Pittsburgh [Allegheny County]: Amer. Jour. Sci. 245, p. 421-433, illus., 1947. A peat deposit was formed in a lake ponded against the Ohio River valley-train. The vegetation is described. There are two levels of ponding recognized but not correlated to substages. A section is measured; fossils are listed.
2. Naturally briquetted coal from a bed in [Clarion County] western Pennsylvania: Jour. Geology 57, p. 79-82, illus., 1949. Coal powder and fragments occur in golf-ball-sized nodules. All the fragments are angular, unsorted, and are less than 1 mm. in size. The nodules are round, and might be pre-lithified, that is, formed before the Lower Kittanning coal (in which they are found) was lithified. By and large, their origin is uncertain.

SCHRAUF, ALBRECHT

1. Die rothen Wulfenit von Rucksberg und Phenixville [Chester County], part 15 *of* Mineralogische Beobachtung II: Kaiserl. Akad. Wissenschaften, Math.-Nat. Klasse, Sitzungsb. 63, abt. 1, p. 184-192, illus., Vienna, 1871. A small amount of chromium gives a red cast to wulfenite, which is analyzed crystallographically.
2. Beiträge zur Kenntniss des Associationkreises der Magnesiasilicate: Zeitschrift fur Krystallographie 6, p. 321-388, Leipzig, 1882. A general treatise of this group of minerals includes in part a discussion of the serpentines of the southeastern counties.

SCHRODER, FRANK CHARLES. See also Sanford, Samuel, 1.

1. Joseph Barrell [1869-1919]: Scientific Monthly 9, p. 93-96, port., 1919.

SCHUCHERT, CHARLES, 1858-1942. See also Miller, Arthur Keith, 3; Ulrich, Edward Oscar, 1.

1. Charles Emerson Beecher [1856-1904]: Amer. Jour. Sci. 4th ser. 17, p. 411-422, 1904.
2. Memoir of Charles Emerson Beecher [1856-1904]: Geol. Soc. Amer., Bull. 16, p. 541-548, port., 1906.
3. Paleogeography of North America: Geol. Soc. Amer., Bull. 20, p. 427-606, illus., 1910. An all-encompassing discussion of the continent includes the Commonwealth. Individual periods are described.
4. Silurian formations of southeastern New York, New Jersey, and [eastern] Pennsylvania: Geol. Soc. Amer., Bull. 27, p. 531-554, 1916. The Medina and Shawangunk Formations are equivalent and form the base of the Silurian. The Clinton shales overlie these and are followed by an unconformity. The Cayugan Series is over the unconformity, of which the base is shale and the

top is limestone. This Series grades into the Devonian with little or no unconformity. Sections are measured.

5. Henry Shaler Williams [1847-1918]—an appreciation of his work in stratigraphy: Amer. Jour. Sci. 4th ser. 46, p. 682-687, 1918.
6. Joseph Barrell [1869-1919]: Science ns 49, p. 605-607, 1919.
7. Joseph Barrell (1869-1919): Amer. Jour. Sci. 4th ser. 48, p. 251-280, port., 1919.
8. Sites and nature of the North American geosynclines: Geol. Soc. Amer., Bull. 34, p. 151-229, illus., 1923. A very detailed discussion of geosynclinal theory, history, and interpretation, includes the Appalachian geosyncline in the Commonwealth. The landmass of Appalachia is discussed. The generalized stratigraphy is listed.
9. John Mason Clarke, 1857-1925: Amer. Jour. Sci. 5th ser. 10, p. 92, 1925.
10. (and Ruedemann, Rudolph). John Mason Clarke (1857-1925): Science ns 62, p. 117-121, 1925.
11. Significance of the Taconic orogeny: Geol. Soc. Amer., Bull. 36, p. 343-350, 1925. Discussion about the relationship of the Taconic disturbance to the Ordovician-Silurian boundary is made. The Richmond beds, for instance, are post-Taconic yet paleontologically Ordovician. Post-Richmond beds represent the Silurian where Richmond beds are present. The post-Maysville disturbance was not as significant as that of the post-Richmond (Taconic).
12. Memorial of John Mason Clarke [1857-1925]: Geol. Soc. Amer., Bull. 37, p. 49-93, port., 1926.
13. Biographical memoir of Joseph Barrell, 1869-1919: Natl. Acad. Sci., Biog. Mem. 12, p. 1-40, port., 1927.
14. Charles Doolittle Walcott—paleontologist, 1850-1927: Science ns 65, p. 455-458, 1927.
15. James Furman Kemp, 1859-1926: Amer. Jour. Sci. 5th ser. 13, p. 99-100, 1927.
16. Biographical memoir of John Mason Clarke [1857-1925]: Natl. Acad. Sci., Biog. Mem. 12, p. 183-244, port., 1928.
17. Charles Doolittle Walcott (1850-1927): Amer. Acad. Arts and Sci., Proc. 62, p. 276-285, 1928.
18. Israel Charles White, 1848-1927: Amer. Jour. Sci. 5th ser. 15, p. 188, 1928.
19. Biographical memoir of [Charles] David White, 1862-1935: Natl. Acad. Sci., Biog. Mem. 17, p. 189-221, port., 1936.
20. Biographical memoir of Othniel Charles Marsh, 1831-1899: Natl. Acad. Sci., Biog. Mem. 20, p. 1-78, port., 1939.
21. The greater structural features of North America, the geosynclines, borderlands, and geanticlines, *in* Geology of North America 1, by R. Ruedemann and R. Balk, *of* Geologie der Erde, ed. by E. Krenkel: p. 56-71, illus., Borntraeger, Berlin, 1939. A general discussion of the paleogeography of the continent includes the Commonwealth. The position of the major structural features during each period is illustrated.
22. (and LeVene, Clara Mae). O[thniel] C[harles] Marsh, pioneer in paleontology: xxi, 541 p., Yale Univ. Press, New Haven, 1940.
23. Stratigraphy of the eastern and central United States: xvii, 1013 p., illus., Wiley and Sons, New York, [1943]. The stratigraphic units in the Commonwealth are listed, and brief correlations are given.

SCOTT, HAROLD WILLIAM

1. Permian . . . fresh-water Ostracodes [Greene County]: Jour. Paleontology 18, p. 141-147, illus., 1944. Nine species of ostracodes are described from the Permian Nineveh limestone. They are unusually well preserved.

SCOTT, WILLIAM BERRYMAN

1. Memoir of Edward D[rinker] Cope [1840-1897]: Geol. Soc. Amer., Bull. 9, p. 401-408, 1898.
2. Paleontological and geological work [of Joseph Leidy, 1823-1891]: Acad. Nat. Sci. Phila., Proc. 75 [Appendix], p. 36-43, 1924.

SCUDDER, SAMUEL HUBBARD, 1837-1911.

1. On the wing of a cochroach from the Carboniferous of Pittstown [Luzerne County], Pa. [abs.]: Boston Soc. Nat. Hist., Proc. 19, p. 238-239, 1877.
2. An insect wing of extreme simplicity from the coal formation: Boston Soc. Nat. Hist., Proc. 19, p. 248-249, 1878. *Euphemerites primordialis* is described

from what is probably [Pennsylvanian] shale from an unknown locality in the Commonwealth.

3. Paleozoic cockroaches—a complete revision of the species of both worlds, with an essay toward their classification [Luzerne and Beaver Counties]: Boston Soc. Nat. Hist., Mem. 3, p. 23-134, illus., 1879. In this monographic treatment, cockroaches from Pittston and Cannelton are described and discussed. They are from the [Pennsylvanian].
4. The species of *Mylacris,* a Carboniferous genus of cockroaches [Luzerne and Beaver Counties]: Boston Soc. Nat. Hist., Mem. 3, p. 299-309, illus., 1884. *Mylacris lucifugum, M. pennsylvanicum* from Pittston, and *M. carbonum, M. priscovolans,* and M. *ovale* from Cannelton are described and illustrated in this monographic-type study.
5. *Dictyoneura* and the allied insects of the Carboniferous epoch [Luzerne County]: Amer. Acad. Arts and Sci., Proc. 20, p. 167-173, 1885. *Titanophasma jucunda, Haplophlebium longipennis,* and *Paolia lacoana* are listed as occurring at Pittston. They are from the [Pennsylvanian].
6. Paleodictyoptera, or the affinities and classification of Paleozoic Hexapoda [Luzerne County]: Boston Soc. Nat. Hist., Mem. 3, p. 319-351, illus., 1885. *Dieconeura rigida* and *Polyneurus laminarum,* from Pittston are described and illustrated in this monographic work.
7. The fossil insects of North America, vol. 1, The Pre-Tertiary insects: 455 p., illus., MacMillan, New York, 1890. A monographic work includes discussion and descriptions of insects from Beaver and Luzerne Counties. The work is actually an accumulation of previously published articles.

SEAL, THOMAS

1. A new locality of beryl [Chester County]: Amer. Jour. Sci. 4, p. 39-40, 1821. The "barrens," a serpentine ridge, west of West Chester, has beryl crystals lying on the surface. They weigh from a few grains to 20 pounds.
2. On hydrargillite with the corundum of [Chester County] Pennsylvania: Amer. Jour. Sci. 2nd ser. 11, p. 267, 1851. Hydrargillite occurs as a coating on corundum near Unionville. A physical description is included. It resembles steatite.

SEAMAN, DAVID MARTIN

1. Fossil collecting in [Allegheny County] Pennsylvania: Mineralogist 6, no. 11, p. 5-6, 1938. A list is given of fossils which can be found in quarries in Pennsylvanian sandstones and shales.
2. The Ames limestone of western Pennsylvania: Pa. Acad. Sci., Proc. 14, p. 77-80, 1940. The fauna of the Ames is listed. It is in the Conemaugh Formation.
3. The Cambridge (Pine Creek) limestone of western Pennsylvania: Pa. Acad. Sci., Proc. 15 p. 60-65, 1941. This limestone in the Conemaugh Formation is described, and the fauna is listed.
4. The Brush Creek limestone of western Pennsylvania: Pa. Acad. Sci., Proc. 16, p. 72-76, 1942. The Brush Creek limestone is in the lower Conemaugh Formation. It is cursorily described, and its fauna listed.

SEAMAN, HENRY. See Selvig, W. A., 1.

SECRIST, MARK HOWARD

1. New data on upper Martinsburg fauna [Dauphin County]: Wash. Acad. Sci., Jour. 28, p. 394-396, illus., 1938. A detailed section of Upper Ordovician rocks is given. Fossils from the Martinsburg Formation are listed. Trilobites and inarticulate brachiopods are illustrated.

SEDDON, WILLIAM

1. Workable coal seams of western Pennsylvania: Engineering and Mining Jour. 84, p. 549-550, 1907. Coal below the Pittsburgh seam is described. Over 34 feet of coal exists. The reserves are "inestimable."

SEIDL, ERICH

1. Hohlformdruck-Tektonik, erläutert am Mulden-und Sattleflanken des Appalachischen und des Ruhr-Lippe Steinkohlgebiets: Deutsche geol. Gesell., Zeitschr. 85, p. 118-133, illus., Berlin, 1933. A comparison is made between the deformation of the anthracite areas in the Commonwealth with that of the Ruhr area. The relations between thrust faults and the synclines in both

areas are pointed out. The relations between sedimentation and tectonics are also shown.

SELLERS, F. W. See Owen, David Dale, 1.

SELTZER, GEORGE S.

1. Structure and stratigraphy of Cove Mountain [Dauphin-Perry Counties]: Pa Acad. Sci., Proc. 15. p. 111-115. 1941. The nose of an eastward-plunging syncline is described. Devonian-Pennsylvanian rocks are involved. The southern limb is overturned toward the north; small minor faults are described.

SELVIG, WALTER A. See also Fieldner, Arno Carl, 1.

1. (and Seaman, Henry). Sulfur forms and ash-forming minerals in Pittsburgh coal: Carnegie Inst. Tech., Mining and Metallurgical Inv., Cooperative Bull. 43, 23 p., 1929. Coal is analyzed and the sulphur is seen to occur as pyrite, calcium sulfate, or as organic sulphur. Its vertical distribution is discussed.

SEYBERT, ADAM

1. Adamantine spar and basaltes [Bucks-Philadelphia Counties]: Medical Repository 3, p. 202-203, 1800. [Corundum] is reported from granite near Chestnut Hill. The [diabase] is "in a situation confirming its neptunian origin."
2. A catalogue of some American minerals which are found in different parts of the United States: Phila. Medical Museum 5. p. 152-159, 256-268. 1808. Included are minerals from many places in the Commonwealth, mostly the southeastern counties.
3. Analysis of a sulphuret of molybdenum [Delaware County]: Amer. Jour. Sci. 4, p. 320-321, 1822. [Molybdenite] occurs in a gangue of quartz near Chester. A detailed chemical analysis is given.
4. Analysis of American chromate of iron [Chester County]: Amer. Jour. Sci. 4, p. 321-323, 1822. A chemical analysis is given. No other details are included.
5. Analysis of a glassy actynolite from Coneard Township, Delaware Co., Penn.: Amer. Jour. Sci. 6, p. 331-333, 1823. A physical description and chemical analysis are given. No details of location are included.

SEYBERT, HENRY

1. Analysis of American minerals [Lebanon-Chester Counties]: Acad. Nat. Sci. Phila., Jour. 2, p. 139-146, 1821. Chemical analyses of a "ferruginous oxydulated copper ore" from Lebanon County, and a "green phosphate of lime (asparagus stone)" from Chester County are given.

SHAFFNER, MARCHANT NISSLEY

1. A buried stream channel near Punxsutawney [Jefferson-Indiana Counties], Pa.: Pa. Acad. Sci., Proc. 12, p. 119-121, illus., 1938. Mines and diamond drills have outlined a sinuous channel of sand in the Pennsylvanian beds. It is a channel which has cut out the coal, and is recognized for over 5 miles. It may have been a master stream during Pennsylvanian time.
2. Structure and stratigraphy of the Smicksburg quadrangle [Indiana, Jefferson, and Armstrong Counties] (preliminary report): Pa. Topog. Geol. Survey [4th ser.], Bull. 121, 12 p. (#), illus. incl. geol. map, 1939. A brief description of the area is given. All the structural features are folds. Mississippian-Pennsylvanian rocks are exposed.
3. Geology and mineral resources of the Smicksburg quadrangle [Jefferson, Armstrong, and Indiana Counties]: Pa. Geol. Survey 4th ser., Topog. Geol. Atlas 55, xi, 252 p., illus. incl. geol. maps, 1946. A complete geologic description of the area is given. Mississippian-Pennsylvanian rocks are exposed. Sections are measured. Coal, gas, clay, sandstone, and limestone are the mineral resources.

SHANNON, EARL VICTOR. See also Wherry, Edgar Theodore, 28.

1. (and Wherry, Edgar Theodore). Notes on white chlorites [Chester County]: Wash. Acad. Sci., Jour. 12, p. 239-241, 1922. White chlorites are analyzed. They result from the action on albite-pegmatite by magnesium-bearing waters derived from the weathering of serpentine and jefferisite. These were originally described by Gordon as colerainite.

SHARP, CHARLES FARQUHARSON STEWART

1. (and Dosch, Earl F.). Relation of soil creep to earthflow in the Appalachian Plateaus: Jour. Geomorphology 5, p. 312-325, illus., 1942. Numerous examples of creep and earthflow are illustrated from an area including the southwest

counties. Creep seems to prepare the way for earthflow, and both are common and not long-lasting. This effect must be important in the topographical development.

SHARP, HENRY STAATS. See also Johnson, Douglas Wilson, 5.

1. Stream selectivity in the [Franklin County] middle Appalachian Valley: Jour. Geology 53, p. 200-205, illus., 1945. Streams in the Great Valley are flowing in shale belts; the limestone areas have been reduced lower in elevation compared to the shale. The shale is much more easily abraded by running water and has, therefore, confined the streams, whereas the limestone has been reduced by rainwash and solution, and confined channels are uncommon.

SHARPLES, S. P. See also Lea, Isaac, 15.

1. Analyses of minerals [Delaware-Chester Counties]: Amer. Jour. Sci. 2nd ser. 42, p. 271-272, 1866. Hornblende is mentioned from Delaware County, and precious serpentine is analyzed from Chester County.

SHATSKY, N. S.

1. O sravneetelnoy tektoneeke severnoy amereekee ee vostochnoy evropi: Isvestiia Akademiia Nauk SSSR, seria geologicheskaia 1945, no. 4, p. 10-26, Moskva, 1945. The tectonic pattern of the Appalachians, including the Commonwealth, is compared with a similar tectonic pattern in an area on the eastern European platform.

SHAW, CHARLES F.

1. (and McKee, J. M., and Ross, W. G.). Reconnaissance soil survey of southeastern Pennsylvania: U. S. Dept. Agriculture, Bur. of Soils [Advance sheet], 100 p., illus., 1914. A complete discussion of the soils and their origins from the rocks of the area includes a soils map.

SHAW, EUGENE WESLEY. See also Raymond, Percy Edward, 7.

1. Gravel and sand in the Pittsburgh district [Beaver, Allegheny, and Armstrong Counties]: U. S. Geol. Survey, Bull. 430, p. 388-399, illus., 1910. Allegheny and Ohio River gravels come direct from glacial material, whereas Monongahela River gravel comes from sedimentary rocks. The gravels are much different. The high glacial gravels are about 24 feet thick. Non-glacial gravels are intermixed. Intermediate and low terraces are from later glaciation. There is late non-glacial gravel also. Some gravels are over 100 feet thick.
2. (and Munn, Malcolm John). Coal, oil, and gas of the Foxburg quadrangle [Venango, Clarion, Butler, and Armstrong Counties], Pennsylvania: U. S. Geol. Survey, Bull. 454, 85 p., illus. incl. geol. map, 1911. Detailed Devonian-Pennsylvanian stratigraphy is discussed. Mississippian-Pennsylvanian rocks are mapped. The various coal beds are described. Oil and gas come from Devonian-Mississippian sands which are described. The structure consists of gentle folds.
3. (and Munn, Malcolm John). Description of the Burgettstown and Carnegie quadrangles [Allegheny, Beaver, and Washington Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 177, 16 p., illus., incl. geol. maps, 1911. A complete geologic description of the area is given. Pennsylvanian-Permian, Pleistocene rocks are mapped. The structure is gentle folds. Coal, petroleum, gas, clay, shale, limestone, and sand and gravel are the economic products discussed.
4. (and Lines, Edwin F., and Munn, Malcolm John). Description of the Foxburg and Clarion quadrangles [Clarion, Armstrong, Butler, and Venango Counties], Pa.: U. S. Geol. Survey, Geol. Atlas of U. S. folio 178, 17 p., illus. incl. geol. maps, 1911. A complete geologic description of the area is given. Mississippian-Pennsylvanian, and Pleistocene rocks are mapped. Devonian rocks are evident in wells. Sections are measured. The rocks are essentially flat lying. Coal, petroleum, and gas are the major resources. Clay, shale, iron ore, limestone and sandstone are also present.
5. High terraces and abandoned valleys in western Pennsylvania: Jour. Geology 19, p. 140-156, illus., 1911. Terraces about 200 feet above the Allegheny, Monongahela, and other large rivers are described. Abandoned parts of valleys are also described. The glacial and post-glacial history of the area is outlined.
6. Ages of peneplains of the Appalachian province: Geol. Soc. Amer., Bull. 29, p. 279-586, 1918. A review of previous estimates is given, and the inharmonious

results are stressed. By correlating present surfaces with buried peneplains, noting the volume of material deposited in the sea, and noting the present-day rate of erosion, the peneplains must be mid-Tertiary or younger, and not Cretaceous as previously considered.

SHAW, J. B.

1. Fire clays of Pennsylvania: Pa. Geol. Survey 4th ser., M-10, 69 p., illus., [1928]. Clays from various parts of the Commonwealth are described and analyzed. The report deals mostly with locations and physical properties, with very little geologic interpretation.

SHEAFER, ARTHUR W.

1. The township geology of Cameron County: Pa. Geol. Survey 2nd, RR, Part 2, p. 1-60, illus. incl. atlas, 1885. A complete geologic description of the area is given. Devonian-[Pennsylvanian] rocks are present. Coal is the chief economic resource.

SHEAFER, PETER WENRICK, 1819-1891.

1. Description of the geology of Schuylkill Co., Pa.: Mining Mag. 2, p. 626-630, illus. incl. geol. map, New York, 1854. An unfinished report of a stratigraphic, structural, and economic survey of the county is given. [Ordovician]-[Pennsylvanian] rocks are described. The map is a sketch map.
2. A map of Schuylkill County, Penna.: Scale, 1 inch equals 2 miles, Barnes and Co., Philadelphia, 1855.
3. Paleontological report for 1854: Pottsville Science Assoc., Bull. Jan.-Feb. 1855, p. 1-3, 1855. A review of the paleontological collection of the newly-formed association includes many specimens from the Commonwealth. No details are included.
4. Coals and collieries of Schuylkill Co., Pa.: Mining and Statistics Mag. 11, p. 19-26, New York, 1858 [not seen].
5. Boring records from the Anthracite basin [Lackawanna County]: Amer. Phil. Soc., Proc. 11, p. 107-110, 1869. Very generalized records of wells in Pennsylvanian rocks are presented. No attempt is made at interpretation. They all are a few hundred feet deep.
6. Well borings in the Wilkes-Barre coal region [Luzerne County]: Amer. Phil. Soc., Proc. 11, p. 235-236, 1870. Two wells, 400 feet deep, are very sketchily logged. They are in the coal formations, but no attempt is made at interpretation.
7. [Origin, use, and reserves of Pennsylvania's coal], an address before the students of the Pardee Scientific Department of Lafayette College, Sept. 5, 1872: Easton, Pa., 1872. This is a popular discussion of the origin of coal, and its use.

SHEPARD, CHARLES UPHAM, 1804-1886.

1. Native iron (?) slightly arseniuretted [Bedford County]: Amer. Jour. Sci. 14, p. 183-186, 1828. Native iron, containing a small amount of arsenic and plumbago is described. Its exact location is uncertain. A crystal is present and is described.
2. On new minerals from Texas, Lancaster Co., Penn.: Amer. Jour. Sci. 2nd ser. 6, p. 249, 1848. A sample of williamsite is described physically and chemically.
3. . . . uwarowite at Wood's chrome mine. Texas [Lancaster County], Pa.: Amer. Jour. Sci. 2nd ser. 41, p. 215-216, 1866. Green crystals are scattered throughout a coarsely granular clinochlore which is intermingled with vermiculite. Chlorochromite is also present. The crystals are small and infrequent.
4. On aquacreptite, a new mineral [Chester County] . . .: Amer. Jour. Sci. 2nd ser. 46, p. 256-257, 1868. The mineral occurs in narrow seams in serpentine. Its physical and chemical characteristics are given.

SHERRILL, RICHARD ELLIS. See also Cathcart, Stanley Holman, 13; Dickey, Parke Atherton, 4; Fettke, Charles Reinhard, 22; Fridley, Harry Marion, 3.

1. Symmetry of northern Appalachian foreland folds: Ph.D. thesis, Cornell Univ., 1933; Jour. Geology 42, p. 225-247, illus., 1934. The folds are basically asymmetrical by about 1.3:1, the steeper limbs facing the energy source. The deformation was caused by tangential stresses from the southeast. The asymmetry is a result of the wedgelike form of the sedimentary cover on which the stresses acted.

2. Local unconformities in Allegheny and Conemaugh formations of southwestern Pennsylvania [abs.]: Geol. Soc. Amer., Proc. 1934, p. 453, 1935.
3. Devonian folding in the Allegheny plateau [abs.]: W. Va. Acad. Sci., Proc. 9, 1935, p. 82, 1936; W. Va. Univ. Bull., ser. 36, no. 13, 1936.
4. (and Matteson, Lawrence Stanley). Geology of the oil and gas fields of the Hilliards quadrangle [Butler-Venango Counties] (advance report): Pa. Topog. Geol. Survey [4th ser.], Bull. 122, 25 p., illus., 1939. Mississippian-Pennsylvanian rocks are at the surface. Some petroleum is in Mississippian rocks, but most comes from the underlying Devonian rocks, which are described from wells. Generalized well records are given. Anticlines control the occurrence of petroleum.
5. (and Matteson, Lawrence Stanley). Oil and gas geology of the Franklin quadrangle [Venango County], Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], M-24, v, 71 p., illus., 1941. Devonian-Pennsylvanian rocks are described. The production comes from gentle folds in the Devonian rocks. Individual pools are described and correlated.
6. Some problems of Appalachian structure: Amer. Assoc. Petroleum Geologists, Bull. 25, p. 416-423, illus., 1941. The origin of the Appalachian folds, including the direction of stress and the mechanics of folding, the effects of rotational stresses, and the date of the folding, is outlined. The foreland, primarily, is considered.
7. (and Dickey, Parke Atherton, and Matteson, Lawrence Stanley). Types of stratigraphic oil pools in Venango sands of northwestern Pennsylvania, *in* Stratigraphic type of oil fields, by A. I. Levorsen, ed.: p. 507-538, illus., Amer. Assoc. Petroleum Geologists, Tulsa, 1941. All the pools are primarily stratigraphic. Three types occur in the Venango sands. The upper are characterized by irregular sands aligned perpendicular to the shore line, the middle pools are from sheet-like sands with pinch-outs shoreward, and the lower pools are from pebbly bars which are approximately parallel to the old shore. Examples of each are given.
8. Possible future oil pools of Pennsylvania: Oil and Gas Jour. 43, no. 12, p. 129-130, 221-225, illus. incl. geol. map, 1944; Pa. Dept. Internal Affairs, Monthly Bull. 12, no. 9, p. 17-21, 1944; no. 10, p. 14-18, 1944; Natl. Oil Scouts and Landsmen's Assoc. Yearb. 1945 [15], p. 554-559, 1945. A resumé is given of the various oil sands in the Commonwealth and includes an outline of those which could be producers. No geologic data are given.
9. Oil and gas field property line maps of the Hilliards quadrangle [Butler-Venango Counties], Pennsylvania: Pa. Geol. Survey 4th ser., Special Bull. 3, illus., 1946. Property-line maps also show the extent of the various underground sands in which the wells are drilled. Devonian-Mississippian stratigraphy is briefly described.

SHERWOOD, ANDREW

1. (edited by J. Peter Lesley). Limits of the Catskill and Chemung formations—[Part] 1 *of* Report of progress in Bradford and Tioga Counties: Pa. Geol. Survey 2nd, G, p. 1-96, illus. incl. geol. maps, [1878]; correction with title, On an error in identifying two distinct beds of iron ore in report G . . ., by E. W. Claypole: Amer. Phil. Soc., Proc. 20, p. 529-530, 1883; correction with title, On two small patches of Catskill represented near Leroy on the map in report G . . ., [Part] D *of* Geological notes, by E. W. Claypole: p. 533-534. A complete geologic description of the area is given. Devonian-[Pennsylvanian] rocks are present, but the coal-bearing beds are described elsewhere. The structure consists of broad folds. Devonian sections are measured; fossils are listed. Iron ore is the chief resource.
2. (and Platt, Franklin). The Geology of Lycoming County: Pa. Geol. Survey 2nd, GG, ix, p. 1-160, illus. incl. geol. map, 1880. A complete geologic description of the area is given. Rocks from Devonian-[Pennsylvanian] are present. Anticlines and synclines are the major structural features. Coal, limestone, and iron ore are the chief economic products. Sections are measured; analyses are made.
3. The geology of Potter County: Pa. Geol. Survey 2nd, GGG, xvi, p. 1-68, illus. incl. geol. map, 1880. A complete geologic description of the county is given. Devonian-Lower [Pennsylvanian] rocks are present. The structure is

discussed in detail. Sections are measured; fossils are listed. No economic resources are reported. The coal, if any, has been left to another report.

SHIMER, HERVEY WOODBURN

1. [Charles] David White (1862-1935): Amer. Acad. Arts and Sci., Proc. 70, p. 600-602, 1936.
2. Memorial to Amadeus William Grabau [1870-1946]: Geol. Soc. Amer., Proc. 1946, p. 155-166, port., 1947.

SHINN, LEO A. See Lohman, Stanley William, 1.

SHRADER, JOHN JOSEPH SHAMBORA

1. Halotrichite found near Freeland [Luzerne County], Pa.: Rocks and Minerals 11, p. 11, 1936. The mineral is reported from the Jeddo-Highland mine but the exact location is uncertain.

SHUTZ, A. G.

1. Beschreibung einiger nordamerikanischer Fossilien: Leipzig, 1791. [not seen, *see* Gordon, S. G., Mineralogy of Pennsylvania, 1922, p. 251].

SIEFERT, WILBUR H. See Fettke, Charles Reinhard, 28.

SILLIMAN, BENJAMIN, 1779-1864. See also Rogers, Henry Darwin, 2.

1. [Miscellaneous localities of minerals]: Amer. Jour. Sci. 5, p. 39-42, 1822. Zeolites, rutile, calcite, sappar, pistazite, and molybdenite are listed from Philadelphia County, and barite is listed from Bucks County. No details are included.
2. Anthracite coal of Rhode Island . . . with an additional notice of the anthracites of Pennsylvania: Amer. Jour. Sci. 11, p. 78-100, 1826. The physical properties of anthracite from the Commonwealth are included.
3. . . . Mauch Chunk and other anthracite regions of [Carbon County] Pennsylvania: Amer. Jour. Sci. 19, p. 1-21, illus., 1830. A very generalized description of the Mauch Chunk [Jim Thorpe] region is given. The structure is simple; a very general stratigraphic sequence is given.
4. Notice of the anthracite region in the valley of the Lackawanna and of Wyoming on the Susquehanna [Luzerne-Lackawanna Counties]: Amer. Jour. Sci. 18, p. 308-328, illus., 1830. A semi-popular account of the area is given. The structure is described and an extremely generalized stratigraphic section is given.

SILLIMAN, BENJAMIN, JR., 1816-1885. See also Thomson, Thomas, 1.

1. Hydrate of nickel, a new mineral [Lancaster County]: Amer. Jour. Sci. 2nd ser. 3, p. 407-409, 1847; addition with title, On emerald nickel from Texas, Lancaster County, Pa.: Amer. Jour. Sci. 2nd ser. 6, p. 248-249, 1848. [Zaratite] is described physically and chemically. It occurs as a crust on chromite.
2. Analyses of "green picrolite" and "slaty serpentine" so-called, from Texas, Lancaster County, Pa.: Amer. Assoc. Adv. Sci., Proc. 2, p. 134, 1849. The common substance is actually williamsite, as shown by chemical analysis.
3. Descriptions and analyses of several American minerals [Chester-Lancaster Counties]: Amer. Jour. Sci. 2nd ser. 8, p. 377-394, 1849. Albite, corundellite, euphyllite, and unionite from near Unionville are described chemically and physically. The albite is also reported from somewhere in Lancaster County.
4. On "indianite" of Count Bournon, and on an American mineral distributed under the same name [Chester-Lancaster Counties]: Amer. Assoc. Adv. Sci., Proc. 2, p. 131, 1849. Physical and chemical descriptions of a mineral previously thought to be indianite show it to be allite.
5. On the new American mineral, lancasterite [Lancaster County]: Amer. Jour. Sci. 2nd ser. 9, p. 216-217, 1850. A magnesian, iron carbonate from the Texas area is described physically and chemically.
6. Optical examinations of several American micas: Amer. Jour. Sci. 2nd ser. 10, p. 372-383, 1850. A chemical, physical, and optical comparison of many kinds of mica is given. Some of the specimens are from the Commonwealth.
7. Notice of two American meteoric irons [Kentucky and Allegheny Counties] Amer. Assoc. Adv. Sci., Proc. 4, p. 36-38, 1851. A meteorite is described which fell near Pittsburgh and which was used as a source of metal for iron bars.
8. Report on the slate quarries of the Lehigh Slate Company at Slatington, Lehigh County, Pennsylvania: p. 9-18, Philadelphia, 1857. The [Martinsburg

Formation] contains the slate. It is highly distorted. Bedding, cleavage, and joints are described, and their relations are noted. The slate is blue and reddish blue, very smooth, and hard.

9. On the fossil iron ore and its associates in southeastern Pennsylvania: Iron and Steel Inst., Jour. 2, p. 334-341, illus., London, 1872. The iron ore occurring in the Silurian in the Commonwealth is discussed. Three zones are recognized, but only one is considered as a good ore. No details are included.

SIMMERSBACH, B.

1. Die Steinkohlengebiete von Pennsylvanien und Westvirginien: Zeitschr. praktische Geologie 11, p. 413-423, illus., Berlin, 1903. A review of [Pennsylvanian] and [Permian] stratigraphy in the Commonwealth is given, along with a short resumé of the coal-bearing units and the reserves.

SIMPSON, GEORGE BANCROFT, 1844-1901. See also Randall, F. A., 2.

1. Catalogue of special collections of fossils, *in* Catalogue of the Geological Museum, Part 3: Pa. Geol. Survey 2nd, 000, p. 175-256, 1889. Lists of fossils from various localities throughout the Commonwealth are given.
2. Descriptions of new species of fossils from the Clinton, Lower Helderberg, Chemung and Waverly groups . . .: Amer. Phil. Soc., Trans. ns 16, p. 435-460, illus., 1890. Nineteen species are described, most of which are new. Most are brachiopods.

SINCLAIR, WILLIAM JOHN

1. A new labyrinthodont from the Triassic of [Bucks County] Pennsylvania: Amer. Jour. Sci. 4th ser. 43, p. 319-321, illus., 1917. *Calamops paludosus* is described from the Norristown shale near Holicong. A jaw containing several teeth is all that remains.
2. A large parasuchian from the Triassic of [York County] Pennsylvania: Amer. Jour. Sci. 4th ser. 45, p. 457-462, illus., 1918. Several bones of *Rutiodon manhattanensis* from Triassic rocks near York are described.

SINGEWALD, JOSEPH THEOPHILIUS, JR.

1. Memorial to George Martin Hall [1891-1941]: Geol. Soc. Amer., Proc. 1941, p. 173-176, port., 1942.
2. [Edward Bennett Mathews, 1869-1943]: Wash. Acad. Sci., Jour. 34, p. 167-168, 1944.

SISLER, JAMES DONALDSON, 1894-1935. See also Ashley, George Hall, 51; Reese, John F., 12.

1. Coal beds in Allegheny County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 30, 9 p. (#), 1922. Nineteen coal beds in the Allegheny-Monongahela Formations are described. The structure is discussed.
2. Coal beds in Armstrong County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 38, 12 p. (#), 1922. Fourteen coal beds in the Allegheny-Monongahela Formations are described. The structure is discussed.
3. Coal beds in Beaver County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 57, 4 p. (#), 1922. Six economic beds are known from the Allegheny-Monongahela Formations. All are described.
4. Coal beds in Butler County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 46, 5 p. (#), 1922. Ten coal beds in the Allegheny Formation are described. The structure is briefly discussed.
5. Coal beds in Cambria County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 23, 13 p. (#) illus., 1922. Twenty coal beds are described from the Pottsville-Conemaugh Formations. Only four are important. The structure of the county is briefly outlined.
6. Coal beds in Center, Cameron, Clinton, and Lycoming Counties, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 50, 8 p. (#), 1922. A number of coal beds in each county are described. Most are from the Allegheny and Pottsville Formations. Not all are economic.
7. Coal beds in Clarion County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 49, 7 p. (#), 1922. Twelve beds in the county are discussed, of which three are not economic. The structure is discussed. The coal is in the Allegheny Formation.
8. Coal beds in Elk County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 41, 5 p. (#), 1922. Ten economic coal beds in the Pottsville and Allegheny Formations are described.

9. Coal beds in Fayette County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 32, 13 p. (#), illus., 1922. Thirty-four coal beds are discussed, but only fourteen are economic. Beds from the Pottsville Formation to the Washington Formation are considered. The structure is briefly discussed.
10. Coal beds in Indiana County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 36, 11 p. (#), 1922. Thirteen economic coals occur in the Allegheny-Monongahela Formations. Each is described. The structure is considered.
11. Coal beds in Greene County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 24, 6 p. (#), 1922. Eight economic coal beds are described from the Monongahela Formation and the Permian System. The structure of the county is described.
12. Coal beds in Jefferson County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 42, 10 p. (#), 1922. Eleven coal beds are present in the Allegheny and Pottsville Formations, of which three are not economic. All are described, as is the structure of the county.
13. Coal beds in Lawrence County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 55, 3 p. (#), 1922. Thirteen coal beds are present in the Allegheny-Monongahela Formations. Few are economic however. All are described.
14. Coal beds in Mercer, Crawford, Venango, Forest, Warren, McKean, Potter, Tioga, and Bradford Counties, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 52, 10 p. (#), 1922. Coal beds from the Pottsville and Allegheny Formations are described. Only Mercer, McKean, Potter, Tioga, and Bradford Counties are important.
15. Coal beds in Washington County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 26, 8 p. (#), 1922. Ten coal beds in the Monongahela Formation and the Permian System are described, as is the structure of the county.
16. Coal beds in Westmoreland County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 34, 15 p. (#), 1922. Sixteen economic coals are described from the Allegheny-Monongahela Formations. The structure of the county is described.
17. The coal deposits of southern Somerset County: Pa. Topog. Geol. Survey [4th ser.], Bull. 22, [16 p.] (#), [1922?]. All four Pennsylvanian coal-bearing formations are present. The coals from each are described as to thickness and stratigraphic position. The Wellersburg, Salisbury-Berlin, and Somerset-Confluence basins are considered separately. Analyses are made.
18. Coal beds in northern Somerset County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 80, 28 p. (#), 1923. Eleven coal beds in the Allegheny-Monongahela Formations are described, as is the structure of the county. Analyses of different coals are given.
19. Coal beds in southern Somerset County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 64, 20 p. (#), illus., 1923. Fourteen economic coal beds occur in the Allegheny-Monongahela Formations. Each is discussed. The structures trend northeastward and are shallow synclines and anticlines. Analyses are given.
20. Volatile matter in Pennsylvania coals: Pa. Topog. Geol. Survey [4th ser.], Bull. 81, 11 p. (#), illus., 1923. This is discussion of an isovol map of the Commonwealth. The amount of volatile matter in coal increases to the north and west. The pressures during folding came from the south-east where most of the volatile matter is gone. Most oil and gas in the Commonwealth is found where the volatile matter in coal is 40 to 45 percent.
21. Bituminous coal losses and mining methods in Pennsylvania, including the thickness, character, and reserves of coal: Pa. Geol. Survey 4th ser., [M4], 216 p., illus., [1924]. The coal beds in the Pennsylvanian and Permian Systems are described in detail. The reserves of each county are calculated, and the total for the Commonwealth is almost 44 billion tons.
22. Coal reserves in Clarion County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 84, 10 p. (#), 1924. Twelve coal beds are present, of which three have no commercial value. Over 1 billion tons remain in reserve.
23. Coal reserves in Jefferson County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 85, 11 p. (#), 1924. Eleven coal beds are present, four of which have little economic importance. Over 2 billion tons remain in reserve.

24. Geology of Pennsylvania bituminous coals, *in* coal analyses—Part 4 *of* Bituminous coal fields of Pennsylvania, Introductory volume: Pa. Geol. Survey 4th ser., [M 6], p. 2-6, 1925; 2nd ed., 1928. A very generalized description of the Pennsylvanian coal-bearing formations is given.
25. Map of the coal fields of Pennsylvania, *in* Detailed descriptions of coal fields—Part 2 *of* Bituminous coal fields of Pennsylvania: Pa. Geol. Survey 4th ser., M 6, [separate], Scale, 1:380,160 or 6 miles per inch, 1929.
26. Correlation of oil and gas sands in Pennsylvania: Pa. State College Mineral Industry Experiment Sta., Bull. 9, p. 4-17, illus., 1930; discussion by J. G. Montgomery, Jr., p. 17-18. The various sand units are described and related to one another. Devonian-Pennsylvanian sands are involved. The correlations are paleontologic and stratigraphic, based on the following wide-spread marking units: Pittsburgh coal, Upper Freeport coal, Vanport limestone, Big Injun sand, Hundred-foot sand, and the base of the Red Catskill beds or the top of the Chemung Formation. Eighteen thousand records were consulted.
27. Detailed description of coal fields—Part 2 *of* Bituminous coal fields of Pennsylvania: Pa. Geol. Survey 4th ser., M 6, xiv, 511 p., illus., 1926; 2nd ed., 1932. A description is given of the coals, coal-bearing rocks, and structure of each of the western counties. Sections are measured. Correlations are made.
28. Correlation of the oil and gas sands, *in* Contributions to the oil and gas geology of western Pennsylvania: Pa. Geol. Survey 4th ser., M 19, p. 16-41, illus., 1933. Twenty-five hundred well records are plotted and the resulting producing-sand correlations are noted. Many composite sections are shown in stratigraphic relation to the Pittsburgh coal. Names and synonyms are listed in stratigraphic position. Pennsylvanian-Devonian sands only are considered.
29. Oil and gas fields of western Pennsylvania: Map, scale, 1 inch equals 6 miles, Pa. Geol. Survey 4th ser., M 19, 1933.

SKINNER, WALTER S. See also Petersen, Richard G., 1; Stevenson, Robert Evans, 2.

1. The Tully formation of eastern Pennsylvania: M.S. thesis, Lehigh Univ., 1948.

SLAVIK, F.

1. Note on zaratite from . . . [Lancaster County] Pennsylvania . . .: Amer. Mineralogist 11, p. 279-280, 1926. Zaratite is reported as a thin mammillary crust on chromite. It is described in detail from the Wood mine.

SLIGH, W. H. See Kessler, D. W., 1.

SMALLWOOD, W. MARTIN. See also Hopkins, Thomas Cramer, 12.

1. (and Hopkins, Thomas Cramer). A discussion of the origin of some anticlinal folds near Meadville [Crawford County], Pa.: Syracuse Univ. Bull. 4th ser. 1, p. 18-24, 1903. Folds in shale exposed in gullies are described. They are attributed to landslides into the gullies.

SMITH, A. DW. See also Lesley, J. Peter, 63.

1. New general map of the anthracite coal fields of Pennsylvania and adjoining counties . . ., 2 sheets: scale, 1:126,720, or 1 inch equals 2 miles, Pa. Geol. Survey 2nd, 1882; [2nd revised edition, 1890]. The map shows coal fields, colliery locations, and production.
2. Report on the anthracite region. Pa. Geol. Survey 2nd, Final Rpt. 3, Part 1, p. 1916-2152, illus., 1895. A complete geologic description of the anthracite region is given. The stratigraphy and structure in each of the basins are described. Over 17 billion tons are in reserve.
3. General map of the anthracite coal fields of Pennsylvania and adjoining counties: Scale, 1 inch equals 2 miles, J. L. Smith, Philadelphia, 1899.

SMITH, AUBREY H.

1. The railway cutting at Gray's Ferry road [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [38] 1886, p. 253-254, 1886. A cut shows that a bed of hard, blue clay underlies the river sand and gravel. The clay contains diatoms and wood fragments. It is interpreted as being from a period of quiescence in the glacial epoch. A water-well log from nearby shows the alternating character of the river deposits, including the clay.

SMITH, EDGAR FOHS. See also Brunner, D. B., 1; Schoenfeld, J., 1.

1. (and Thomas, N. Wiley). Corundum and wavellite [Lehigh County]: Amer. Phil. Soc., Proc. 20, p. 230-231, 1882. Crystals of the minerals are described

and analyzed. The corundum is from near Shimersville and the wavellite is from near Macungie.

2. Minerals from Lehigh County, Pa.: Amer. Chemical Jour. 5, p. 272-279, 1883. Allophane, fluorite, zircon, wavellite, corundum, tourmaline, garnet, stilbite, pyrolusite, and chloropal from various localities are described and analyzed.
3. Mineralogical notes [Lehigh County]: Amer. Chemical Jour. 6, p. 411-414, 1885. Pectolite and titanite are described and analyzed.
4. Some Berks County minerals: Acad. Nat. Sci. Phila., Proc. 62, p. 538-540, 1910. Laumontite, apophyllite, pyroxene, chabazite, and scolectite from near Reading are described.

SMITH, GEORGE

1. Geology *in* History of Delaware County with a notice of the geology: p. 403-415, illus., Philadelphia, 1862 [not seen].

SMITH, GEORGE OTIS

1. Charles Doolittle Walcott [1850-1927]: Amer. Jour. Sci. 5th ser. 14, p. 1-6, port., 1927.
2. Charles Doolittle Walcott [1850-1927]: Smithsonian Inst., Ann. Rpt. 1927, p. 555-561, illus. incl. port., 1928.
3. Charles D[oolittle] Walcott [1850-1927] and the United States Geological Survey: Smithsonian Misc. Collections 80, no. 12, p. 17-18, port., 1928.

SMITH, HAROLD THEODORE UHR. See also Bryan, Kirk, 1.

1. Periglacial boulder field in [Carbon County] northeastern Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 59, p. 1352-1353, 1948.

SMITH, ISABEL F.

1. A columbite crystal from Boothwyn [Delaware County], Pennsylvania: Ph.D. thesis, Bryn Mawr College, 1919; Amer. Mineralogist 4, p. 121-123, illus., 1919. A columbite crystal from a pegmatite in gabbro is described. A list of other localities of columbite from southeastern Pennsylvania is included.
2. Genesis of anorthosites of Piedmont [Chester County] Pennsylvania: Pan-Amer. Geologist 38, p. 29-50, illus., 1922. The Honeybrook anorthosite is described and mapped in detail. Various theories of origin are reviewed. It is considered a magmatic differentiate.

SMITH, JOHN LAWRENCE, 1818-1888.

1. (and Brush, George Jarvis). Re-examination of American minerals—Part 1, Emerylite, euphyllite . . . unionite, kerolite . . . lancasterite, hydromagnesite . . .: Amer. Jour. Sci. 2nd ser. 15, p. 207-215, 1853;—Part 2, Chesterlite . . . chesterlite-talc, rhodophyllite . . . emerald nickel [kämmererite]: 2nd ser. 16, p. 41-43, 1853;—Part 4, . . . lanthanite . . .: 2nd ser. 18, p. 372-381, 1854, Part 5, The minerals of the Wheatley mine in [Chester County] Pennsylvania: Amer. Assoc. Adv. Sci., Proc. 9, p. 190-204, illus., 1856; addition with title, On the descloizite . . .: Amer. Jour. Sci. 2nd ser. 48, p. 137-138, 1869. Physical and chemical descriptions are given. Emerylite is identified with margarite; unionite is identical with oligoclase; lancasterite is a mechanical mixture of brucite and hydromagnesite. Chesterlite is shown to be orthoclase; chesterlite-talc is a mica; and rhodophyllite is the same as rhodochrome.
2. On the lesleyite of Chester Co., Penn. . . .: Amer. Jour. Sci. 2nd ser. 48, p. 254-255, 1869. Lesleyite is analyzed and appears to have the same properties as ephesite, from Asia Minor. The alkalies of the two varieties are reversed, however. The lesleyite has potash; the ephesite has soda.

SMITH, LAWRENCE LOWE

1. The stratigraphy, structure, and physiography of the Delaware Valley from the Water Gap to Kintnersville [Northampton County], Pennsylvania: M.S. thesis, Lafayette College, 1919.
2. Magnetite deposits of French Creek [Chester County], Pennsylvania: Ph.D. thesis, Johns Hopkins Univ., 1924; Pa. Geol. Survey 4th ser., M-14, 52 p., illus. incl. geol. map, 1931. Triassic diabase intruding Precambrian limestone has deposited magnetite and associated minerals. The origin is considered. Analyses are given.

SMITH, LLOYD B.

1. A peridotite dike in Fayette and Greene Counties: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1910-12, p. 151-155, illus., 1912. The geographical extent of the

dike is traced in mines and outcrop. The dike has created natural coke where it has crossed coal beds, and semianthracite is also locally a result. It is up to 20 feet in thickness. The effects of the dike on the various kinds of rocks are considered. The age is post-Permian and pre-glacial.

SMITH, SANDERSON

1. On some new localities of minerals: Amer. Assoc. Adv. Sci., Proc. 9, p. 188-190, 1855. Allanite occurs as a gangue of zircon at Reading (Berks County), as does copper silicate. Chrysocolla from Lebanon County is mentioned, as is smithsonite from Lehigh County. Serpentine is mentioned from Northampton County; few details are included.

SMITH, THOMAS P.

1. Account of crystallized basaltes found in Pennsylvania [Lancaster County]: Amer. Phil. Soc., Trans. 4, p. 445-446, 1799. [Diabase] is described from near Elizabethtown and Campbelltown and is attributed to a neptunian origin because of the clastic rocks interbedded with it.

SMITHSONIAN INSTITUTION

1. Meteorite from [Butler County] Pennsylvania: Geol. Soc. Oregon Country, Geol. News Letter 5, p. 15-16 (#), 1939. The fall of the meteorite near Chicora, on June 24, 1938 is described, and its path is calculated.

SMOCK, JOHN CONOVER

1. The useful minerals of the United States—eastern division: U. S. Geol. Survey, Mineral Resources [1882], p. 664-747, 1883. The states, including the Commonwealth have the economic minerals listed with a brief geographic description. No geologic information is included.
2. Geologico-geographical distribution of the iron ores of the eastern United States: Amer. Inst. Mining Engineers, Trans. 12, p. 130-144, 1884; Engineering and Mining Jour. 37, p. 217-218, 230-232, 1884. A generalized discussion of the occurrence of various kinds of iron ore, arranged stratigraphically, is given. No new data are included.

SNYDER, H. N.

1. (and Swingle, R. J.). Analyses of coal as shipped or delivered, *in* Analyses of Pennsylvania bituminous coals: U. S. Bur. Mines, Tech. Paper 590, p. 39-129, 1939. Proximate, ultimate and physical analyses are made of over 1700 samples of coal from various parts of the Commonwealth.

SOSMAN, ROBERT BROWNING

1. Evidence on the intrusion temperature of [Fayette County] peridotites: Amer. Jour. Sci. 5th ser. 35-A, p. 353-359, 1938. Experiments on coal inclusions show that the temperature of the enclosing peridotite dike did not exceed 500° C., whereas laboratory tests show that peridotite melts at over 1000° C. An intrusion other than liquid is postulated.

SPACKMAN, GEORGE. See Carpenter, George W., 2.

SPENCER, ARTHUR COE. See also Stose, George Willis, 20.

1. Magnetite deposits of the Cornwall type in Berks and Lebanon Counties, Pa.: U. S. Geol. Survey, Bull. 315, p. 185-189, 1907. Iron ore is likely to be found wherever diabase has intruded Paleozoic limestone. Large diabase bodies are more favorable than small ones; dikes and steep sills are more favorable than gentle sills. Much ore occurs in limestone which is between the diabase and a less metamorphism-susceptible rock.
2. Magnetite deposits of the Cornwall type in [southeastern] Pennsylvania: U. S. Geol. Survey, Bull. 359, 102 p., illus. incl. geol. maps, 1908. The Cornwall deposit is a body of contact-metamorphosed limestone into which magnetite was deposited by diabase emanations during Triassic time. Deposits in Berks, Lebanon, Chester, and York Counties of a similar origin are described. Analyses are given.
3. The Jauss iron mine, Dillsburg [York County], Pa.: U. S. Geol. Survey, Bull. 430, p. 247-249, 1910. Magnetite associated with Triassic diabase is described. The ore has replaced certain strata of limestone conglomerate. There are three layers, and future prospecting is outlined.

SPENCER, JOSEPH WILLIAM WINTHROP. See also Wright, George Frederick, 13.

1. Discovery of the preglacial outlet of the Lake Erie basin: Pa. Geol. Survey 2nd, QQQQ, p. 359-406, illus., 1881; Amer. Phil. Soc., Proc. 19, p. 300-337,

illus., 1881; corrections, inside cover. A northward-flowing river in what is now Lake Erie drained northern Pennsylvania to the north before turning east to Lake Ontario. This work complements Carll (I-3. 1880) who recognized the pre-glacial northward drainage of the Allegheny River.

SPRUNK, GEORGE CARL

1. (and others). Splint coals of the Appalachian region—their occurrence, petrography, and comparison of chemical and physical properties with associated bright coals: U. S. Bur. Mines, Tech. Paper 615, iv, 59 p., illus., 1940. Splint coal is described and its occurrences in the Commonwealth are discussed. It occurs mostly in the Pottsville and Allegheny Formations. Analyses are made.

STADNICHENKO, TAISIA MAXIMOVNA

1. Progressive regional metamorphism of the Lower Kittanning coal bed of western Pennsylvania: Economic Geology 29, p. 511-543, illus., 1934. Chemical and physical changes occur eastward, that is, progressive carbonization has occurred in that direction. Coal has 58.6 percent carbon at the Allegheny River and 84.7 percent carbon at the Allegheny Front. Thrust pressure is the best explanation. Various physical features, such as laminae, bands, fusain content, etc., are compared; they change from mine to mine.

STANTON, TIMOTHY W.

1. Memoir of Joseph Francis James [1857-1897]: Geol. Soc. Amer., Bull. 9, p. 408-412, 1898.
2. [Charles] David White [1862-1935]: Jour. Geology 43, p. 778-780, 1935.

STAPLES, J. M.

1. The iron ore deposits at Cornwall [Lebanon County], Pa.: Compass 19, p. 246-249, illus., 1939. A brief description of the geology and mineralogy of the area is given. No details are included.

STAUDD, J. N. See Thiessen, Reinhardt, 2.

STEIDTMANN, EDWARD

1. Summaries of pre-Cambrian literature in North America: Jour. Geology 28, p. 558-568, 643-658, 743-751, 1920; 29, p. 81-86, 173-187, 1921. This is an annotated review of the literature dealing with Precambrian rocks. The Commonwealth is included (v. 29, p. 81-86). The correlations made by others are discussed. No new proposals are made.

STELZNER, ALFRED

1. On the biotite holding amphibole granite from Syene (Assuan): Amer. Inst. Mining Engineers, Trans. 11, p. 367-379, illus., 1883. A description of an amphibolite-granite (or gneiss) from Germantown is included; it is compared with syenite from Egypt.

STEPHENSON, ROBERT CHARLES. See also Cleaves, Arthur Bailey, 8; Fettke, Charles Reinhard, 29; Foose, Richard Martin, 19.

1. Pyrophyllite discovery adds new mineral resource [Adams County]: Pa. Dept. Internal Affairs, Monthly Bull. 16, no. 3, p. 3-5, illus., 1948. Pyrophyllite occurs in aporhyolite as a replacement due to hot waters rising from depths. The mineralogy is given.

STEPHENSON, THOMAS E.

1. The structural petrology of a Triassic diabase: M.S. thesis, Lehigh Univ., 1947.

STERRETT, DOUGLAS BOVARD

1. Mica deposits of the United States: U. S. Geol. Survey, Bull. 740, xi, 342 p., illus., 1923. A complete description of the industry includes the deposits in Delaware County. Schistose gabbro contains mica as do intruding pegmatites. It also occurs in mica-gneiss with enclosed pegmatites. None is very extensive.

STEVENS, RICHARD P.

1. Contributions to the paleontological synchronism of the coal measures of Ohio and Illinois: Amer. Jour. Sci. 2nd ser. 26, p. 72-79, 1858. In a comparison of the [Pennsylvanian] rocks of Ohio and Indiana, several examples are taken from the Commonwealth to show fossil zones.
2. On the extension of the Carboniferous system of the United States so as to include all true coals: Lyceum of Nat. Hist. New York, Annals 7, p. 414-419, 1862. All the periods from the [Mississippian] to at least Jurassic should be in the "coal measures." Faunal and floral reasons are cited. Examples from the Commonwealth are included.

STEVENSON, JOHN JAMES, 1841-1924. See also Hall, Charles Edward, 5.

1. The upper Coal Measures west of the Alleghany Mountains: Lyceum of Nat. Hist. New York, Annals 10, p. 226-252, illus., 1873. Correlations are made between the [Pennsylvanian] rocks of western Pennsylvania and farther west in Ohio. They were not connected physically with the coal fields farther west.
2. On the alleged parallelism of coal beds: Amer. Phil. Soc., Proc. 14, p. 283-295, 1875. Abundant evidence is cited to show that the interval between coal-seams changes, hence the beds cannot be parallel. Discontinuous deposition is suggested as the answer.
3. Report of progress in the Greene and Washington [Counties] district of the bituminous coal fields of western Pennsylvania: Pa. Geol. Survey 2nd, K, 419 p., illus. incl. geol. maps, 1876. A complete description of the geology of this area is given. Only [Pennsylvanian] rocks are at the surface; [Quaternary] terraces are described. Sections are measured; fossils are listed; analyses are made. Coal, iron ore, limestone, stone, clay, and petroleum are the chief resources.
4. Report of progress in the Fayette and Westmoreland [Counties] district of the bituminous coal-fields of western Pennsylvania—Part 1, Eastern Allegheny County and Fayette and Westmoreland Counties west from Chestnut Ridge: Pa. Geol. Survey 2nd, KK, viii, 437 p., illus. incl. geol. map, 1877. A complete geologic description of the area is given. [Mississippian]-[Pennsylvanian] rocks are exposed. Sections are measured; fossils are listed; analyses are made. Coal and iron are the chief economic products.
5. Report of progress in the Fayette and Westmoreland [Counties] district of the bituminous coal fields of western Pennsylvania—Part 2, The Ligonier Valley: Pa. Geol. Survey 2nd, KKK, x, 331 p., illus. incl. geol. maps, 1878. A complete geologic description of the area is given. [Pennsylvanian] rocks are described in detail; Devonian and [Mississippian] rocks are also present. Sections are measured; fossils are listed; analyses are made. Coal and iron are the major economic products. Zinc, lead, salt, natural gas, limestone, cement, stone, and clay are minor products.
6. Surface geology of southwest Pennsylvania . . . : Amer. Phil. Soc., Proc. 18, p. 289-316, illus., 1879; summary, Amer. Jour. Sci. 3rd ser. 15, p. 245-250, 1878. Benches and terraces along the rivers and valleys are described. There are two sets of benches, the higher ones with an unvarying level, and the lower ones with irregular elevations. Twenty-five are described. Erosion began before the rejuvenation of the area. The benches are due to the cutting of pre-existing valleys during intervals of rest during the emergence. The terraces were then re-established by glacial phenomena after emergence was completed.
7. The upper Devonian rocks of southwest Pennsylvania: Amer. Jour. Sci. 3rd ser. 15, p. 423-430, 1878. Chemung-like beds immediately underlie the Pocono Formation here and the Catskill Formation appears to be absent. No unconformity is proposed until more information is available. More likely, the Catskill Formation has thinned out.
8. The geology of Bedford and Fulton Cos.: Pa. Geol. Survey 2nd, T 2, xv, 382 p., illus. incl. geol. maps, 1882. A complete geologic description of the area is given. Ordovician-[Pennsylvanian] rocks are present. The structure (folds) is described in detail. Sections are measured; fossils are listed. Coal is the major mineral resource. Iron ore, limestone, stone, fire clay, and mineral springs are also present.
9. Some notes respecting metamorphism: Amer. Phil. Soc., Proc. 22, p. 161-166, 1885. Metamorphic intensity is discussed in general, with examples from the Commonwealth.
10. Notes on the Lower Carboniferous groups along the easterly side of the Appalachian area in Pennsylvania and the Virginias: Amer. Jour. Sci. 3rd ser. 34, p. 37-44, 1887. There are notable variations in thickness of the [Mauch Chunk] and [Pocono] Formations. Limestone increases westwardly in the [Mauch Chunk]; but the thickness of the whole formation decreases. The [Pocono] Formation varies in thickness also. It decreases from 1300 feet at the Allegheny Front to 400 feet in Fayette County. The [Loyalhanna] limestone increases in thickness westward.

11. Report of the Subcommittee on the upper Paleozoic (Carbonic): International Congress of Geologists, American Committee, Rpt. D, 14 p., Philadelphia, 1888; Amer. Geologist 2, p. 248-256, 1888; Internatl. Geol. Cong., 4th, London 1888. C. R. App. A, p. 147-157, London, 1891. An attempt at international understanding on correlations is made. Sections in the Commonwealth are used as examples.
12. The Chemung and Catskill (upper Devonian) on the eastern side of the Appalachian basin: Amer. Assoc. Adv. Sci., Proc. 40, p. 219-247, 1892; Amer. Geologist 9, p. 6-33, 1892. Chemung-Catskill rock relations are noted throughout the Commonwealth. The Catskill rocks thicken and the Chemung rocks thin eastward. The western Chemung Formation is the time-equivalent of the eastern Portage, Chemung, and Catskill Formations. Sections are measured.
13. John Strong Newberry [1822-1893]: Amer. Geologist 12, p. 1-25, port., 1893.
14. On the use of the name "Catskill": Amer. Jour. Sci. 3rd ser. 46, p. 330-337, 1893. Arguments are presented to show why the Upper Devonian Series should be called Chemung as a [time-rock] unit rather than Catskill. The latter has a great deal of local physical significance with certain types of rocks.
15. Origin of the Pennsylvania anthracite: Geol. Soc. Amer., Bull. 5, p. 39-70, illus., 1893. Previous theories are discussed and rejected. There is: (1) a thickening of coal formations northeastward toward the anthracite region, and (2) a decided, but gradual, decrease in volatiles in direction of increased thickness. Chemical change was more complete toward the east. The coal swamps followed the marshes as they advanced westward, and so there was a longer time for the eastern beds to be exposed to chemical changes. Folding has not been a factor.
16. Memoir of James Hall [1811-1898]: Geol. Soc. Amer., Bull. 10, p. 425-451, port., 1900.
17. Notes upon the Mauch Chunk of Pennsylvania: Amer. Geologist 29, p. 242-249, 1902. The formation in general is discussed, with a detailed section from Fayette County measured, which includes the Greenbrier limestone. Fossils are listed. The name Mauch Chunk is not a good name for the unit.
18. J. Peter Lesley [1819-1903]: Science ns 18, p. 1-3, 1903.
19. Lower Carboniferous of the Appalachian basin: Geol. Soc. Amer., Bull. 14, p. 15-96, 1903. Detailed descriptions of [Mississippian], rocks some of which are in Pennsylvania. Sections are measured and correlated. Geologic history is given.
20. Carboniferous of the Appalachian basin—[Part 1]: Geol. Soc. Amer., Bull. 15. p. 37-210, 1904;—[Part 2]: 17, p. 65-228, 1906;—[Part 3]: 18, p. 29-178, 1907. The Pottsville-Dunkard rocks are described completely and correlated throughout the eastern United States. including the Commonwealth. Synonony is extensively discussed. Sections are measured, and fossils are listed.
21. Memoir of J. Peter Lesley [1819-1903]: Geol. Soc. Amer., Bull. 15, p. 532-541, port., 1904.
22. The formation of coal beds: Amer. Phil. Soc., Proc. 50, p. 1-116, 519-643, 1911; 51, p. 423-553, 1912; 52, p. 31-162, 1913; reprinted in book form. A resumé of the historical development of ideas on coal formation is followed by characteristics of different types of coal and of the rocks in which they are found. Abundant examples are taken from the Commonwealth. An extensive swamp is suggested, which is periodically invaded by the sea.

STEVENSON, ROBERT EVANS

1. Pigmentation of the black Triassic argillite of Bucks County, Pennsylvania: Pa. Acad. Sci., Proc. 22, p. 131-134, 1948. Ferrous iron, with minor amounts of carbon and ferric oxide, is the cause of the color in the Lockatong argillite. Chemial determination results are given.
2. (and Skinner, W. S.). The Tully clastics of New York and [northeastern] Pennsylvania: Pa. Acad. Sci., Proc. 23, p. 29-33, illus., 1949. Generalized sections of the Tully Formation are listed from three localities. The fauna is listed, and correlations are made.

STEWART, BELLE KATHERINE. See Stewart, Paul Rich, 1.

STEWART, DUNCAN, JR.

1. Memorial of Benjamin LeRoy Miller [1874-1944]: Rocks and Minerals 19, p. 177-184, 1944; Amer. Mineralogist 30, p. 142-147, port., 1945.

STEWART, PAUL RICH

1. (and Stewart, Belle Katherine). Paleontological survey of the 1100± feet above the Monongahela formation in southwestern Pennsylvania [abs.]: Amer. Phil. Soc., Yearbook 1939, p. 297-298, 1940.

STODDARD, JESSE C.

1. (and Callen, Alfred C.). Ocher deposits of eastern Pennsylvania [Berks-Lehigh Counties]: U. S. Geol. Survey, Bull. 430, p. 424-439, illus., 1910. [Cambro-Ordovician] limestone contains disseminated iron which is concentrated as a residual deposit at the surface. The ore occurs as geodes and as nodules of limonite which are earthy. Individual deposits are described.

STOEK, HARRY HARKNESS, 1866-1923.

1. Notes on the iron ores of Danville [Montour County], Pennsylvania . . .: Amer. Inst. Mining Engineers, Trans. 20, p. 369-385, illus., 1892. Ferruginous limestone and sandstone are described in the Silurian beds. The limestone is fossiliferous.
2. The Pennsylvania anthracite coal field: U. S. Geol. Survey, Ann. Rpt. 22, Part 3, p. 55-117, illus., 1902. A complete survey of the stratigraphy and structure of the fields is given. The structure is described by many cross sections. Coal seams in individual fields are described.

STONE, RALPH WALTER. See also Hickok, William Orville, 4th, 8; Sanford, Samuel, 1; Anonymous, 60.

1. Oil and gas fields of eastern Greene County, Pa.: U. S. Geol. Survey, Bull. 225, p. 396-412, illus., 1904. The [Mississippian]-Pennsylvanian section is described. Oil comes from the Conemaugh Formation, and [Mississippian] sands. Gas comes from various [Mississippian] sands. The structure controls the presence of oil and gas.
2. The Elders Ridge coal field [Armstrong-Indiana Counties], Pennsylvania: U. S. Geol. Survey, Bull. 225, p. 311-324, illus., 1904. Most of the coal within the Elders Ridge syncline comes from the Pittsburgh bed which is seven feet thick in places. The coal is described from many sections.
3. Description of the Elders Ridge [Indiana-Armstrong Counties] quadrangle: U. S. Geol. Survey, Geol. Atlas of U. S. folio 123, 10 p., illus. incl. geol. maps, 1905. A complete geologic description of the area is given. Pennsylvanian and Pleistocene formations are mapped. The structure is shown as southwestward-plunging folds. Coal is the chief mineral resource. Gas, oil, limestone, sandstone, and clay are minor resources.
4. Description of the Waynesburg [Greene, Washington, and Fayette Counties] quadrangle: U. S. Geol. Survey, Geol. Atlas of U. S. folio 121, 12 p., illus. incl. geol. maps, 1905. A complete geologic description of the area is given. Pennsylvanian-Permian, and Pleistocene rocks are mapped. The rocks are essentially horizontal. Sections are measured; fossils are listed. Coal is the most important mineral resource; gas, oil, stone, clay, and iron ore are also present.
5. Mineral resources of the Elders Ridge quadrangle [Indiana-Armstrong Counties], Pennsylvania: U. S. Geol. Survey, Bull. 256, 86 p., illus., 1905. Pennsylvanian and Quaternary rocks are described. The structure is gentle folds. Devonian-[Mississippian] rocks are described from wells. Coal is the major resource; gas, limestone, clay, and shale are also present. All are described.
6. Water resources of the Elders Ridge quadrangle [Armstrong-Indiana Counties], Pennsylvania: U. S. Geol. Survey, Water-Supply Paper 110, p. 164-165, 1905. The sand of the river terraces is the largest source of ground water. The various [Pennsylvanian] sandstones are good potential aquifers, but most of the water supply of the area is from surface streams.
7. Water resources of the Waynesburg quadrangle [Greene County], Pennsylvania: U. S. Geol. Survey, Water-Supply Paper 110, p. 166-167, 1905. Local wells in the Permian sands and shales, and in the Pleistocene river gravel and sand, serve as the main source of water. Springs are common but not large. One large-volume well is in the Waynesburg standstone.
8. (and Clapp, Frederick Gardner). Oil and gas fields of Greene County, Pa.: U. S. Geol. Survey, Bull. 304, 110 p., illus., 1907. Devonian-Permian rocks are described in detail. The structure is gentle folds. Location and properties

of the individual sands are given. Individual oil and gas fields are described. Well records are included.

9. Clay and shale, *in* Review of general geology of southwestern Pennsylvania in light of recent work: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1906-08, p. 307-325, illus., 1908. Residual and transported clays are common. Plastic clay occurs as underclay. Flint clays are also present. Shale is very common in Pennsylvanian rocks.
10. Coal, *in* Review of general geology of southwestern Pennsylvania in light of recent work: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1906-08, p. 218-265, illus., 1908. This is a general review of coal stratigraphy and distribution; it is considered by quadrangle. Local details are also discussed. Analyses are made.
11. Limestone in western Pennsylvania: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1906-08, p. 326-334, illus., 1908. Sixteen limestone formations occur in the [Mississippian]-Permian rocks. Each is described, and some are considered much more important than others.
12. Physiography of southwestern Pennsylvania, *in* Review of general geology of southwestern Pennsylvania in light of recent work: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1906-08, p. 120-127, illus., 1908. The Schooley peneplain, Harrisburg peneplain, later terraces, and drainage changes are briefly outlined. Abandoned channels of the Monongahela and Youghiogheny Rivers are described.
13. Review of general geology [of Pennsylvania]: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1906-08, p. 109-119, illus., 1908. A very generalized description of the Commonwealth is given. The physiographic provinces are outlined and discussed individually and briefly.
14. Sandstones [and iron ore] of southwestern Pennsylvania: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1906-08, p. 335-340, illus., 1908. Only a few sandstones are pure or persistent enough to serve as reliable sources of stone. Various [Pennsylvanian]-Permian sands are described. A brief mention is made of iron ore from some of the shale beds. None is now mined, however.
15. Stratigraphy, *in* Review of general geology of southwestern Pennsylvania in light of recent work: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1906-08, p. 128-189, illus., 1908. Permian-[Pennsylvanian] formations are described in very fine detail. Sections are measured; correlations are made.
16. Structure, *in* Review of general geology of southwestern Pennsylvania in light of recent work: Pa. Topog. Geol. Survey [3rd ser.], Rpt. 1906-08, p. 205-218, illus., 1908. This is essentially a map of structure contours on the Pittsburgh coal bed. Anticlines and synclines are the most obvious features. The folds become more gentle to the north and west. Some normal faults are described.
17. Magnesite in [Lancaster-Chester Counties] Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 28, 3 p. (#), 1922. Magnesite occurs in veins in serpentine. The origin is not discussed.
18. Potash fiasco in Tioga County, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 58, 5 p. (#), 1922. A niter deposit in a cave is shown to be locally-contaminated calcite incrustations. The potash has its origin in guano.
19. Flagstone industry in northeastern Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 72, 7 p. (#), 1923. Thin-bedded Devonian sandstones are being used for flagstone. The future of the deposit is considered. Production statistics are given.
20. Roofing granules industry in southeastern Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 82, 4 p. (#), 1923. Crushed slate and greenstone are used as a source of granules. Several milling plants are discussed, but little of the geology is described.
21. Meteorites found in Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 35, p. 107, 1924; Pan-Amer. Geologist 41, p. 152-153, 1924.
22. Molding sands in Pennsylvania (preliminary report): Pa. Geol. Survey [4th ser.], Bull. 87, 20 p. (#), 1925. Locations and descriptions of molding-sand deposits are given by county, as well as are analyses of the pertinent physical properties.
23. Black granite of northern Bucks County, Pennsylvania [abs.]: Pa. Acad. Sci., Proc. 1, p. 63, 1926.

24. Pennsylvania building stone [abs.]: Pa. Acad. Sci., Proc. 1, p. 100, 1926.

25. Asymmetrical drainage in [Greene County] southwestern Pennsylvania: Pa. Acad. Sci., Proc. 2, p. 34-37, illus., 1928. South-flowing tributaries to the main east-west streams are longer than the north-flowing tributaries. Rock structure does not have any effect. The rapid melting of snow on south-facing slopes increased the run off, hence longer streams developed. Elsewhere in the Commonwealth, rock hardness has a greater control.

26. Molding sands of Pennsylvania: Pa. Geol. Survey 4th ser., M 11, 94 p., illus., 1928. Molding sand comes from certain Quaternary river deposits, Cambrian quartzites in southeastern Pennsylvania, the Oriskany sandstone, and several Pennsylvanian sands. Each deposit of importance is described.

27. Pennsylvania caves: Pa. Geol. Survey 4th ser., G-3, 63 p., illus., 1930. Descriptions and maps of caves, mostly in southeastern and central Pennsylvania, are given.

28. Relation of Pennsylvania limestone caves to geologic structure: Pa. Acad. Sci., Proc. 4, p. 103-104, 1930. The shapes of caves are determined by the attitude of the limestone. Many Pennsylvania examples are given. Straight-passage caves occur in steeply dipping limestone; irregular caves follow joint patterns in flat lying limestone.

29. (and Hughes, Harry Herbert). Feldspar in Pennsylvania: Pa. Geol. Survey 4th ser., M-13, 63 p., illus., 1931. A complete detailed discussion of the occurrence and associations of feldspar is given. Deposits in Chester, Delaware and Montgomery Counties are described.

30. Pennsylvania's nonmetallic minerals are worth $110.000.000 each year: Pit and Quarry 23, no. 4, p. 25-34, illus., 1931. A review, discussing the wide variety of stone in the Commonwealth, includes cement, sand, glass sand, granite, gneiss, schist, trap, serpentine, talc, limestone, marble, sandstone, ganister, slate, and others.

31. Building stones of Pennsylvania: Pa. Geol. Survey 4th ser., M-15, 316 p., illus., 1932. This is a complete description of the stone sources of the Commonwealth. Granite, gneiss, schist, diabase, serpentine, limestone, dolomite, marble, sandstone, quartzite, and slate are the rocks considered. The distribution by county is listed.

32. Cave concretions [Bedford, Huntingdon, and Mifflin Counties]: Pa. Acad. Sci., Proc. 6, p. 106-109, illus., 1932. Porous, concentric, travertine concretions are described as being formed in quiet water of various caves. They are spherical and ellipsoidal. Most are less than 1 inch in diameter, although some of them are as large as two and one half inches in diameter. Inorganic crystallization is the probable origin, as the 50° temperature and absolute darkness eliminate bacteria.

33. Geology and mineral resources of Greene Co., Pa.: Pa. Geol. Survey 4th ser., C-2, 175 p., illus. incl. geol. map, 1932. A complete geologic description of the area is given. Pennsylvanian-Permian rocks are at the surface, as is Pleistocene river clay. Oil and gas comes from the Devonian rocks. The structure is composed primarily of anticlines and synclines. Coal, petroleum, and gas are the chief mineral resources. Limestone, sandstone, clay, shale, glass sand, sand and gravel, and iron are minor resources. Sections are measured; analyses are given.

34. Meteorites found in Pennsylvania: Pa. Geol. Survey 4th ser., G-2, 28 p., illus., 1932. Five meteorites are described and analyzed. They are from Allegheny, Somerset, Adams, Lycoming, and York Counties. All are iron.

35. (and others). Pennsylvania caves: Pa. Geol. Survey 4th ser., G-3, 2nd ed., 143 p., illus., 1932. Caves from many parts of the Commonwealth are described. Many are mapped. They are described by county.

36. (and Hickok, William Orville, 4th). [Geology of] South Mountain [Adams-Cumberland Counties], trip 4: Field Conf. of Pa. Geologists, 3rd, p. 11-14 (#), illus., Harrisburg, 1933. This is a road log of a trip to the Precambrian and lower Paleozoic rocks in the Blue Ridge. No details are given.

37. No meteorite [Clarion County]: Science ns 77, p. 87, 1933. A reported meteorite is a boulder of Pennsylvanian sandstone.

38. Meteorites in Pennsylvania: Pa. Acad. Sci., Proc. 8, p. 124-126, 1934. Statistically, the five meteorites known from the Commonwealth are few compared with those known from other states.
39. Asbestos, barite, corundum, rutile, and vermiculite in Pennsylvania [abs.]: Amer. Mineralogist 20, p. 198, 1935; Geol. Soc. Amer., Proc. 1934, p. 112-113, 1935.
40. Meanders in Raystown Branch of Juniata River [Bedford-Huntingdon Counties]: Pa. Acad. Sci., Proc. 9, p. 74-79, illus., 1935. The meanders occurred after a peneplain had been uplifted. The stream's downcutting was slowed down as it cut through the quartzite at Jacks Mountain. A temporary base level occurred and upstream, the Raystown Branch expended its energy in sidecutting.
41. Lime in the Mauch Chunk formation [Somerset County] [abs.]: Geol. Soc. Amer., Proc. 1935, p. 109, 1936.
42. Surveys created after people of State demanded information on Commonwealth's resources: Pa. Dept. Internal Affairs, Monthly Bull. 2, no. 1, p. 14-16, 1936. A very generalized historical description of the four surveys of the Commonwealth is given.
43. Geologic section in southern Somerset County, Pa.: Pa. Acad. Sci., Proc. 11, p. 78-81, 1937. The Mauch Chunk Formation is 200 feet thick in the northern and southwestern parts of the county, 400-500 in the central, and over 800 in nearby Maryland. This variation is due to irregular deltaic deposition and an unconformity at the top. Sections are measured.
44. Rock salt in Pennsylvania [abs.]: Economic Geology 32, p. 1072, 1937.
45. Boiling Springs [Cumberland County] yields 400 barrels per minute: Pa. Dept. Internal Affairs, Monthly Bull. 7, no. 12, p. 6-7, 1939. A popular account of this spring is given.
46. Gold in Pennsylvania, but not in paying quantities: Pa. Dept. Internal Affairs, Monthly Bull. 7, no. 8, p. 5-9, 1939. A popular resumé of the gold occurrences in the Commonwealth is given.
47. Non-metallic minerals [of Pennsylvania]: Pa. Geol. Survey 4th ser., M 18-C, 46 p., 1940. A general review of the non-metal deposits and reserves in the Commonwealth is given.
48. The waters under the earth—their origin and nature—[Part 1]: Pa. Dept. Internal Affairs, Monthly Bull. 8, no. 11, p. 3-9, illus., 1940;—[Part 2]: no. 12, p. 20-26, 1940. This is a generalized, popular description of ground water, with examples drawn from the Commonwealth.
49. Science "goes soft" to grant [Adams County] woman's fifty-year old wish [Mt. Joy meteorite]: Pa. Dept. Internal Affairs, Monthly Bull. 10, no. 1, p. 5-9, illus., 1941. A fragment of the Mt. Joy meteorite is returned to the finder. The meteorite is analyzed and described.
50. Caves of Pennsylvania attract attention: Pa. Dept. Internal Affairs, Monthly Bull. 10, no. 4, p. 15-16, 1942. Locations of new caves in the Commonwealth are given. A generalized account of the geology is given.
51. Metals and metal mining in Pennsylvania: Pa. Dept. Internal Affairs, Monthly Bull. 10, no. 4, p. 3-9, illus., 1942. A generalized, popular account of the occurrence of chromium, copper, iron, lead, manganese, and zinc is given.
52. More Pennsylvania caves are reported: Pa. Dept. Internal Affairs, Monthly Bull. 10, no. 10, p. 7-14, illus., 1942. A popular account of cave localities not previously reported is given. No maps are included.
53. Pennsylvania caves and their locations: Pa. Dept. Internal Affairs, Monthly Bull. 10, no. 2, p. 3-7, illus., 1942. This is a catalog of the known cave locations in the Commonwealth. The locations are only approximate. No other data are included.
54. So-called "warm" springs in Pennsylvania: Pa. Dept. Internal Affairs, Monthly Bull. 10, no. 8, p. 8-12, illus., 1942; no. 9, p. 18-21, 1942. Springs in Perry County are measured and are found to be slightly abnormal in temperature. The "warm" spring reported from Huntingdon County no longer flows.
55. Evolution of life on earth as told by the rocks: Pa. Dept. Internal Affairs, Monthly Bull. 11, no. 8, p. 3-12, illus., 1943. A popular account of the evolution theory with examples of fossils from the Commonwealth is given.

56. (and Ashley, George Hall). Benjamin LeRoy Miller, 1874-1944: Economic Geology 39, p. 368-369, 1944.
57. Earthquake—September 5, 1944, felt in Pennsylvania: Pa. Dept. Internal Affairs, Monthly Bull. 12, no. 11, p. 3-5, 13-14, 20, 1944. This is a popular account and list of earthquakes which have been felt in the Commonwealth. Some were centered here.
58. Pennsylvania's eighth meteorite reported [Allegheny County]: Pa. Dept. Internal Affairs, Monthly Bull. 14, no. 9, p. 32, 1946. A popular account of the find is given, as is a very generalized description. It is a stony meteorite. It fell in 1886.

STORRS, ARTHUR H.

1. The anthracite coal fields of Pennsylvania: Mining Mag. 11, p. 211-221, illus., New York, 1905. A review of the geology and mining problems in the anthracite region is given. Cross sections are included.

STOSE, ANNA ISABEL JONAS. See also Jonas, Anna Isabel; Stose, George Willis, 41, 45.

1. (and Stose, George Willis). Geology of the Hanover-York district [York-Adams Counties], Pennsylvania: U. S. Geol. Survey, Prof. Paper 204, vii, 84 p., illus. incl. geol. map, 1944. A complete geologic description of the region is given. Precambrian-Ordovician, and Triassic rocks are present. The structure is primarily overthrusts, the Martic being one of the major ones. Sections are measured. Limestone is the chief mineral resource. Many minor products are also present.

STOSE, GEORGE WILLIS. See also Bascom, Florence, 17, 18, 21; Campbell, Marius Robinson, 14; Jonas, Anna Isabel, 7, 10, 12, 14; Miller, Benjamin LeRoy, 22; Miller, Ralph LeRoy, 1; Stose, Anna Isabel Jonas, 1; Wherry, Edgar Theodore, 10; Willis, Bailey, 7.

1. The structure of a part of South Mountain [Franklin County], Pennsylvania [abs.]: Science ns 17, p. 387, 1903.
2. Barite in [Franklin County] southern Pennsylvania . . .: U. S. Geol. Survey, Bull. 225, p. 515-517, 1904. Barite is associated with folded Cambrian limestone and is usually found in the clay residuum. It is massive, banded, subcrystalline or granular, and milky. The barite occurs as a cement in limestone breccia.
3. Physiographic studies in southern Pennsylvania [Franklin County]: Jour. Geology 12, p. 473-484, illus., 1904. The Schooley peneplain is present at 2000-2100 feet. The Harrisburg peneplain is at 750 feet, and a possible Somerville equivalent is at 620 feet. An intermediate, uncorrelated peneplain is described.
4. Water resources of the Chambersburg and Mercersburg quadrangles [Franklin-Fulton Counties], Pa.: U. S. Geol. Survey, Water-Supply Paper 110, p. 156-158, 1905. Springs in Paleozoic limestone are the chief source of water for the area. No details are given.
5. (and Martin, George Curtis). Water resources of the . . . Hancock quadrangle . . . [Fulton County], Pennsylvania: U. S. Geol. Survey, Water-Supply Paper 145, p. 58-63, 1905. Small springs occur in the Paleozoic rocks of the area. Most of the other water sources are from surface water.
6. The sedimentary rocks of South Mountain [Franklin County], Pennsylvania: Jour. Geology 14, p. 201-220, illus., 1906. Cambrian-Ordovician rocks are described, as is the structure. The structure is relatively simple except for some steep folds which are cut by oblique faults. No thrust faults are evident.
7. Phosphorus ore at Mount Holly Springs [Cumberland County], Pa.: U. S. Geol. Survey, Bull. 315, p. 474-483, 1907. Wavellite nodules occur in residual clay deposits from Cambrian rocks. Iron and manganese nodules are also present and contain phosphorus.
8. White clays of South Mountain [Cumberland County], Pennsylvania: U. S. Geol. Survey, Bull. 315, p. 322-334, illus., 1907. White clay occurs as a residual accumulation of decomposed Cambrian rocks, possibly shales. It is siliceous, low in iron, and high in alkali. Individual deposits are described, mostly from around Mt. Holly Springs.
9. The Cambro-Ordovician limestones of the Appalachian Valley in southern Pennsylvania: Jour. Geology 16, p. 698-714, 1908. The section from the

Tomstown dolomite to the Chambersburg limestone is described in detail. Sections are measured; fossils are listed.

10. Description of the Mercersburg-Chambersburg district [Franklin-Fulton Counties], Pa.: U. S. Geol. Survey, Geol. Atlas of U. S. folio 170, 19 p., illus. incl. geol. map, 1909. A complete detailed description of the area is given. Precambrian-Devonian rocks are present. Iron, clay, barite, limestone, cement, sand, and stone are the chief mineral resources.
11. The copper deposits of South Mountain in [Adams-Franklin Counties] southern Pennsylvania: U. S. Geol. Survey, Bull. 430, p. 122-131, illus., 1910. Native copper and various copper ores occur in the Precambrian volcanic rocks of the region. It occurs in metamorphosed basic flows. It was concentrated by solutions which dissolved it as sulphate and deposited it later in cavities, etc. in the rock. Several specific occurrences are described.
12. (and Swartz, Charles Kephart). Description of the Pawpaw and Hancock quadrangles [Bedford, Franklin, and Fulton Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 179, 24 p., illus. incl. geol. maps, 1912. The southern portions of these counties are included in a very detailed description of the region. Cambrian-Mississippian, and Tertiary rocks are mapped. The structure is complex folds and faults. Cement rock and limestone are the chief mineral resources in those parts of the quadrangle which are in the Commonwealth.
13. The mechanics of a cross fault in [Adams County] the northern Appalachians [abs.]: Wash. Acad. Sci., Jour. 5, p. 486-487, 1915.
14. Origin of Delaware Water Gap [Northampton-Monroe Counties] and of the surrounding features: Text and map, Delaware Water Gap quadrangle, Pa.-N. J., scale, 1 inch equals 1 mile, U. S. Geol. Survey, 1916; also 1942 edition. The text on the back of the 15-minute quadrangle sheet explains the physiography of the region, and especially the water gap.
15. (and Lewis, Joseph Volney). Triassic igneous rocks in the vicinity of Gettysburg [Adams-York Counties], Pa.: Geol. Soc. Amer., Bull. 27, p. 623-644, illus. incl. geol. map, 1916. Fractures in Triassic rocks permitted Triassic diabase sills to be emplaced. The diabase is differentiated from coarse-grained, pink to light or dark gray in the larger bodies, to dense black rock at the contact zones. Analyses are given.
16. Age of certain shales in Cumberland-Lebanon Valley, Pennsylvania [abs.]: Wash. Acad. Sci., Jour. 7, p. 82-83, 1917.
17. Glauberite crystal cavities in the Triassic rocks in the vicinity of Gettysburg [Adams County], Pa.: Amer. Mineralogist 4, p. 1-4, illus., 1919. Molds of cubic glauberite are reported and illustrated from the diabase-baked Triassic shale in several localities. It suggests arid climates during the time of deposition. The salt was crystallized from drying lakes.
18. (and Jonas, Anna Isabel). The lower Paleozoic section of southeastern Pennsylvania: Wash. Acad. Sci., Jour. 12, p. 358-366, 1922. The Hellam, Chickies, Harpers, Antietam, Vintage, Kinzers, Ledger, Elbrook and Conococheaque Formations of Cambrian age and the Conestoga limestone of Ordovician age are described.
19. (and Jonas, Anna Isabel). Ordovician overlap in the Piedmont province of [southeast] Pennsylvania and Maryland: Geol. Soc. Amer., Bull. 34, p. 507-524, illus., 1923. Conestoga limestone rests on all formations from Ordovician to Precambrian, indicating the overlap. Fossils are listed; sketch maps are included.
20. New type of structure in the Appalachians [Lancaster-Chester Counties]: Geol. Soc. Amer., Bull. 35, p. 465-480, illus. incl. geol. maps, 1924; abstract with discussions, p. 63-64, 1924. The Paleozoic rocks in the Piedmont show typical Appalachian folds and thrusts which have been modified by Triassic block faulting. Grabens occur with synclinal substructures, and horsts occur with anticlinal substructures.
21. Geology and mineral resources of Adams County, Pa.: Pa. Geol. Survey 4th ser., C 1, 153 p., illus. incl. geol. map, 1932; issued in part *as* Mineral resources of Adams County, Pennsylvania, C-1, Part 2, 64 p., illus., 1925. A complete geologic description of the area is given. Precambrian-Ordovician, Triassic, and Quaternary rocks are present. Folds and faults are common. Sections

are measured; fossils are listed. Iron ore is the major resource; many minor products are described.

22. (and Jonas, Anna Isabel). Triassic rocks northwest of Lebanon [Lebanon County], Pennsylvania [abs.]: Pan-Amer. Geologist 43, p. 368-369, 1925.
23. (and Jonas, Anna Isabel). Triassic sedimentary rocks and basaltic flow northwest of Lebanon [Lebanon County], Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 36, p. 160-161, 1925; Pan-Amer. Geologist 43, p. 154, 1925.
24. (and Jonas, Anna Isabel). Ordovician shale and associated lava in southeastern Pennsylvania: Geol. Soc. Amer., Bull. 38, p. 505-536, illus., 1927. The Martinsburg Formation rests unconformably on lower Trenton to Middle Cambrian aged rocks. The Leesport limestone is a Martinsburg Formation equivalent. Cocalico shale and Conestoga limestone may be correlative. A basaltic lava bed occurs in the basal Martinsburg shale in Lebanon County; purple and green shale near the base of the Martinsburg and Cocalico shales may be altered volcanic ash.
25. Possible post-Cretaceous faulting in the Appalachians: Geol. Soc. Amer., Bull. 38, p. 493-503, illus., 1927. The 300-foot difference in elevation between the higher Kittatinny and lower Schooley peneplains is explained by post-Cretaceous normal faulting of the Kittatinny peneplain along the west-border faults of the Triassic basins. Other peneplains are correlated accordingly.
26. High gravels of Susquehanna River above Columbia [Lancaster-Dauphin Counties], Pennsylvania: Geol. Soc. Amer., Bull. 39, p. 1073-1086, illus., 1928. Nine levels of gravel can be detected along the Susquehanna River. They are from oldest (highest) to youngest (at river level): Kittatinny, Patapsco. Weverton, Eocene?, Bryn Mawr, and Brandywine gravels, the Sunderland river terrace, Wicomoco terrace, and Talbot terrace.
27. (and Bascom, Florence). Description of the Fairfield and Gettysburg [Adams, Franklin, and Cumberland Counties] quadrangles: U. S. Geol. Survey, Geol. Atlas of U. S. folio 225, 22 p., illus. incl. geol. maps, 1929. A complete geologic description of the area is given. Precambrian-Ordovician, and Triassic rocks are mapped. The structure is very complex; close folds and thrust faults are common. Iron ore is the chief economic product. Many others are present also.
28. Review of the peneplains and gravel terraces of the northern Appalachians [abs.]: Wash. Acad. Sci., Jour. 20, p. 152-153, 1930.
29. Unconformity at the base of the Silurian in southeastern Pennsylvania: Geol. Soc. Amer., Bull. 41, p. 629-657, illus., 1930. There is an angular unconformity between the Tuscarora (Silurian) and Martinsburg (Ordovician) Formations east of Susquehanna Gap. The Juniata Formation overlies the unconformity in the south and central part of the Commonwealth, and the Tuscarora Formation overlies the Juniata Formation. Sections are measured; fossils are listed.
30. (and Ljungstedt, Olof Axel). Geologic map of Pennsylvania: Scale, 1 inch equals 6 miles, Pa. Geol. Survey [4th], 1931.
31. Geologic map of the United States, 4 sheets: Scale, 1:2,500,000, U. S. Geol. Survey, 1932.
32. (and Jonas, Anna Isabel, and Ashley, George Hall). Washington to Harrisburg, Juniata River and Cornwall Mines, *in* Southern Pennsylvania and Maryland: Internatl. Geol. Cong., 16th, U. S. 1933, Guidebook 10, Excursions B-1, B-2, p. 1-26, illus. incl. geol. map, 1932. This is a guidebook and itinerary for a field trip along the Susquehanna River in York, Dauphin, Juniata and Lebanon Counties. Precambrian-Tertiary rocks are exposed. Strip geologic maps are included.
33. (and Jonas, Anna Isabel). Geology and mineral resources of the Middletown quadrangle [Lebanon-Dauphin, Lancaster, and York Counties], Pa.: U. S. Geol. Survey, Bull. 840, 86 p., illus. incl. geol. map, 1933. A complete description and discussion of the area is given. Precambrian to Tertiary rocks are present. Sections are given. Limestone, sand, clay, stone, and limonite are the chief resources.
34. Geology of the Appalachian trail between Susquehanna River and the Virginia-Tennessee line, *in* Guide to paths in the Blue Ridge, the Appalachian Trail and side trails: p. 337-369, illus., Potomac Appal. Trail Club, Washington,

D.C., 1934. A brief, popular description of the Blue Ridge geology and physiography is given.

35. Comparison of Cambrian rocks of northwest Scotland with equivalent formations of the Appalachians: Wash. Acad. Sci., Jour. 25, p. 174-180, 1935. The Cambrian beds in Scotland have a close similarity to those of eastern Pennsylvania. The lithology, sequence, and faunal content are correspondent. The Scottish section is thinner. The beds were deposited in the same geosyncline, under the same climatic and shore conditions although they are now widely separated.

36. (and Jonas, Anna Isabel). Highlands near Reading [Lebanon-Berks Counties], Pa., an erosion remnant of a great overthrust sheet: Geol. Soc. Amer., Bull. 46, p. 757-780, illus. incl. geol. maps, 1935; discussion by B. L. Miller and D. M. Fraser, p. 2031-2039; reply by authors, p. 2039-2040; discussion with title, Contributions to the geology of the Reading Hills, Pa., by D. M. Fraser, 49, p. 1199-1212, illus. incl. geol. maps, 1938; reply by authors: Amer. Jour. Sci. 237, p. 281-286, 1939; abstracts with discussion: Geol. Soc. Amer., Proc. 1934, p. 113-114, 1935; Wash. Acad. Sci., Jour. 25, p. 509-510, 1935. The Reading Prong is interpreted as an overthrust remnant. Longitudinal valleys are windows; structural relations are given; mylonitization is evident; klippen are shown. The roots are down-dropped in the Triassic basins. The thrusting occurred during the Appalachian Revolution. Miller and Fraser question the nature and validity of the evidence.

37. Structure of the Honeybrook [Lancaster-Chester Counties] uplift, Pennsylvania: Geol. Soc. Amer., Bull. 48, p. 977-1000, illus. incl. geol. maps, 1937. This uplift is composed of the Mine Ridge, Barren Hills, and Welsh Mt. anticlines. Precambrian to Ordovician rocks are involved. Thrust-faulted folds with some normal faults are the major structures. The thrusts are post-[Pennsylvanian] and the normal faults are Triassic.

38. (and Glass, Jewell Jeannette). Garnet crystals in cavities in metamorphosed Triassic conglomerate in York County, Pennsylvania: Amer. Mineralogist 23, p. 430-435, illus., 1938. Contact metamorphic garnet-crystal cavities are described. The cavities result from the solution of pebbles from a limestone conglomerate. The calcium, silicon, and iron have formed andradite garnets. Some hematite is present.

39. (and Jonas, Anna Isabel). Geology and mineral resources of York County, Pa.: Pa. Geol. Survey 4th ser., C 67, v, 199 p., illus. incl. geol. map, 1939. A complete geologic description of the area is given. Precambrian-Ordovician, Triassic, and Tertiary rocks are mapped. The structure is extremely complex. Limestone, slate, clay, sand, stone, iron ore, copper, and garnet are the mineral resources discussed.

40. Age of the Schooley peneplain: Amer. Jour. Sci. 238, p. 461-476, illus., 1940. The accordant Appalachian summits are slightly reduced remnants of the surface; the Schooley peneplain passes below the Coastal Plain sedimentary rocks and is the same as the Fall Zone peneplain; the Schooley peneplain was formed primarily in Jurassic time. Younger, partial peneplain remnants are present below it.

41. (and Stose, Anna Isabel Jonas). Further evidence of Reading overthrust [Lehigh County] [abs.]: Geol. Soc. Amer., Bull. 51, p. 2007-2008, 1940.

42. [Arthur Keith, 1864-1944]: Wash. Acad. Sci., Jour. 34, p. 240, 1944.

43. (and others). Geologic map of North America, 2 sheets: Scale, 1:5,000,000, Geol. Soc. Amer., New York, 1946.

44. The Taconic sequence in Pennsylvania: Amer. Jour. Sci. 244, p. 665-696, illus., 1946. Ordovician shales in the Great Valley, so often called Martinsburg shales, are not Martinsburg. They differ lithologically. They are compared with the Taconic sequence in New York. Detailed mapping results are discussed, and the rocks are considered Taconic klippen, possibly related to the Martic overthrust. Sections are measured.

45. (and Stose, Anna Isabel Jonas). Stratigraphy of the Arvonia slate, Virginia: Amer. Jour. Sci. 246, p. 393-412, illus., 1948. The slate belt of Virginia is compared with similar structural and aged rocks in Lancaster-York Counties, the Peach Bottom slates. They are considered Silurian in age. Evidence of a Taconic age for the Martic overthrust is reviewed.

46. Bailey Willis [1858-1949]: Wash Acad. Sci., Jour. 39, p. 346-347, 1949.
47. The fault at the west edge of the Triassic in [York-Adams Counties] southern Pennsylvania: Amer. Jour. Sci. 247, p. 531-536, illus., 1949. Paleozoic limestone is exposed under Triassic rocks near the western edge where the rocks are thickest. A double north-border fault is postulated. The block in the middle did not settle as far as the eastern block and so was covered with only a thin veneer of very late-deposited sediments. Diabase marks the eastern fault line.

STOW, MARCELLUS HENRY

1. Contributions to the petrography of the Oriskany sandstone [abs.]: Thesis, Cornell Univ., 3 p., 1931; Va. Acad. Sci., Proc. 1932-33, p. 52, [1933].
2. Authigenic tourmaline in the Oriskany sandstone [central Pa.]: Amer. Mineralogist 17, p. 150-152, illus., 1932. Well-rounded detrital tourmalines with jagged edges from secondary growth are described from many places including the Commonwealth.
3. Conditions of sedimentation and sources of the Oriskany sandstone as indicated by petrology: Amer. Assoc. Petroleum Geologists, Bull. 22, p. 541-564, illus., 1938; discussion by A. B. Cleaves, p. 1108-1111; reply by author, p. 1111, 1938. Two heavy mineral suites were recognized in the Oriskany Formation of central Pennsylvania. Tourmaline, zircon, rutile, and leucoxene are south of New York and indicate a sedimentary provenance, probably from Cambrian and Silurian terranes.

STRAHLER, ARTHUR NEWELL. See also Von Engeln, Oscar Dedrich, 1.

1. Hypothesis of stream development in the folded Appalachians of Pennsylvania: Geol. Soc. Amer., Bull. 56, p. 45-87, illus., 1945. The various theories for the stream pattern through the folded mountains are reviewed, and evidence against each is presented. Additional evidence is produced to support the idea of regional superposition from a peneplain. For instance, the streams do not take advantage of major faults in the area, and the absence of faults in the water gaps is notable.
2. Elongate entrenched meanders of Conodoguinet Creek [Cumberland County], Pa.: Amer. Jour. Sci. 244, p. 31-40, illus., 1946. Elongate, entrenched meanders, with long limbs and sharp bends are attributed to the greater ease of corrasion in the direction of the cleavage of the underlying slate (Martinsburg). This direction is transverse to the strike of the beds. Cut-offs are rare.

STROCK, LESTER WILLIAM

1. A study of the Pensauken formation [Philadelphia County]: Wagner Free Inst. Science, Bull. 4, p. 3-10, illus., 1929. A railroad cut in Philadelphia has exposed the formation. It rests on [Precambrian] gneiss and is about 35 feet thick. The thin Cape May Formation overlies its upper member the "Philadelphia Blue Clay". The Pensauken Formation is considered marine or estuarine.
2. Spessartite from Avondale, Delaware County, Pa.: Amer. Mineralogist 15, p. 40-42, 1930. A garnet crystal is completely analyzed and described. The garnets occur in pegmatite in granite gneiss.

SWAIN, FREDERICK MORRILL, JR. See also Swartz, Frank McKim, 12.

1. Some faunas from the Onondaga formation in central Pennsylvania and West Virginia: M.S. thesis, Penn. State College, 1939.
2. Geology and economic aspects of the more important high-calcium limestone deposits in Pennsylvania: Pa. State College Mineral Industry Experiment Sta., Bull. 43, 31 p., illus., 1946. A general review of high-calcium limestones is followed by a detailed discussion of specific deposits. The important high-calcium deposits are the Vanport, Valentine, Annville, and Kinzers limestones.

SWAIN, JAMES FULTON, 1903-1948.

1. Historical mechanics of Clinton sand deposition [abs.]: Oil and Gas Jour. 45, no. 47, p. 113, 1947.

SWARTZ, CHARLES C.

1. The Devono-Carbonic section of northwestern Pennsylvania: M.A. Thesis, Columbia Univ., 1904.

SWARTZ, CHARLES KEPHART, 1861-1949. See also Stose, George Willis, 12.

1. (and Bassler, Harvey). Typical section of the Allegheny formation [abs.]: Geol. Soc. Amer., Bull. 30, p. 153-154, 1919.

2. Correlation of the Silurian formations of Maryland with those of other areas: Md. Geol. Survey, Silurian, p. 183-232, 1923. Tables of faunas and discussions of correlations include the Commonwealth as well as other areas. Formations and groups are considered.
3. Earlier Silurian formations of Pennsylvania [abs.]: Pan-Amer. Geologist 41, p. 152, 1924; Geol. Soc. Amer., Bull. 35, p. 104-105, 1924; discussion by G. H. Ashley and G. H. Chadwick, p. 105.
4. (and Swartz, Frank McKim). Silurian of the central Appalachians [abs.]: Geol. Soc. Amer., Bull. 40, p. 112-113, 250, 1929; Pan-Amer. Geologist 51, p. 148-149, 1929.
5. (and Swartz, Frank McKim). Early Silurian formations of southeastern Pennsylvania: Geol. Soc. Amer., Bull. 42, p. 621-661, illus., 1931. Sections are measured and fossils are listed from the Rose Hill shale, Keefer sandstone, Rochester shale, McKenzie Formation, Bloomsburg red beds, Wills Creek Formation, Inwood sandstone, Tuscarora quartzite, and the Clinton shale. Correlations are made.
6. (and Swartz, Frank McKim). Middle Devonian age of much of the supposed Oriskany sandstone of eastern Pennsylvania [abs.]: Geol. Soc. Amer., Proc. 1937, p. 117, 1938.
7. (and Swartz, Frank McKim). Early Devonian and late Silurian formations of southeastern Pennsylvania: Geol. Soc. Amer., Bull. 52, p. 1129-1191, illus., 1941; Pa. State College Mineral Industry Experiment Sta.. Tech. Paper 71, 1941. Sections including the Bloomsburg to Onondaga Formations are measured in many locations. The fossils are listed and the various beds are correlated. The Keyser limestone has affinities with both the Silurian and Devonian.
8. (and others). Correlation of the Silurian formations of North America: Geol. Soc. Amer., Bull. 53, p. 533-538, illus., 1942. A time-rock chart of the Silurian including the Commonwealth is given. Comments are made about some of the correlations.
9. Memorial to Edward Bennett Mathews [1868-1944]: Geol. Soc. Amer., Proc. 1944, p. 259-264, port., 1945.

SWARTZ, FRANK McKIM. See also Butts, Charles, 18; Foose, Richard Martin, 19; Krynine, Paul Dimitri, 10; Swartz, Charles Kephart, 4, 5, 6, 7; Willard, Bradford, 33, 67.

1. The Helderberg group from central Pennsylvania to southwestern Virginia: Pa. Acad. Sci., Proc. 3, p. 75-88, illus., 1929; Pa. State College Mineral Industry Experiment Sta., Bull. 4, 27 p., illus., 1929. The Helderberg group in central Pennsylvania contains, from bottom to top, the Keyser, Coeyman's, New Scotland. and Becraft limestones, and the Shriver chert. Sections are measured; fossils listed and illustrated.
2. Correlation of the McKenzie shale [abs.]: Geol. Soc. Amer., Bull. 41, p. 117-118, 1930; Pan-Amer. Geologist 53, p. 146, 1930.
3. Revision of the ostracode family Thlipsuridae, with description of new species from the Lower Devonian of Pennsylvania: Jour. Paleontology 6, p. 36-58, illus., 1932; Pa. State College Mineral Industry Experiment Sta., Tech. Paper 3, 1932. Included with a general paleontological discussion are descriptions of twelve Ostracoda. Most are from the Shriver chert and Onondaga limestone.
4. Dimorphism and orientation in ostracodes of the family Kloedenellidae from the Silurian of Pennsylvania: Jour. Paleontology 7, p. 231-260, illus., 1933; Pa. State College Mineral Industy Experiment Sta., Tech. Paper 6, illus., 1933. Female brood pouches are recognized in Kloedenellidae, making necessary the revision of many species once considered distinct because of the brood pouches. Certain family revisions and orientation are revised. Specimens from the Rochester and McKenzie Formations are considered.
5. Silurian sections near Mount Union [Mifflin County], central Pennsylvania: Geol. Soc. Amer., Bull. 45, p. 81-134, illus., 1934. The entire Silurian section is exposed and measured in detail near Mt. Union and near Lewistown. These and other sections are correlated and the faunas are listed.
6. Relations of the Silurian Rochester and McKenzie formations near Cumberland, Maryland, and Lakemont [Blair County], Pa.: Geol. Soc. Amer., Bull. 46, p. 1165-1194, illus., 1935; Pa. State College Mineral Industry Experiment Sta., Tech. Paper 17, 1935. Two sections are measured in detail. The faunal

zones are discussed and are the same in both areas. Certain zones can be restricted to specific lithologic units. The *Drepanellina clarki* zone, for instance, is restricted to the Rochester Formation, which is overlain by the *Schuchertella elegans* zone. The faunas are distinct, and can be used to separate the formations where they otherwise appear to be similar.

7. Silurian sections in north-central Pennsylvania [abs.]: Geol. Soc. Amer., Proc. 1934, p. 114, 1935.
8. Revision of the Primitiidae and Beyrichiidae, with new Ostracoda from the Lower Devonian of Pennsylvania: Jour. Paleontology 10, p. 541-586, illus., 1936; Pa. State College Mineral Industry Experiment Sta., Tech. Paper 32, 1936. Included with a general paleontological discussion are descriptions of many ostracodes from the Shriver chert of central Pennsylvania.
9. Ostracoda from the Lower Devonian of eastern New York and Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 49, p. 1902-1903, 1938.
10. Keyser limestone and the Helderberg group, *in* The Devonian of Pennsylvania, by B. Willard: Pa. Topog. Geol. Survey 4th ser., G 19, p. 29-91, illus., 1939. The Keyser limestone is considered as the base of the system. It overlies Silurian limestones. Three members can be recognized. The thickness varies. The Helderberg group is, from bottom to top: Coeymans limestone, New Scotland Formation, Becraft limestone, Mandata shale and chert, and Licking Creek limestone. Detailed sections are measured; fossils are illustrated.
11. Allegheny front [field] trip: Field Conf. of Pa. Geologists, 11th, [9 p.] (#), illus., [n.p.] [1941]. A detailed mimeographed road itinerary of a field trip visiting Cambrian-Pennsylvanian rocks along the Allegheny Front is given.
12. (and Swain, Frederick Morrill). Ostracodes of the Middle Devonian Onondaga beds of central Pennsylvania: Geol. Soc. Amer., Bull. 52, p. 381-458, illus., 1941; Pa. State College Mineral Industry Experiment Sta., Tech. Paper 70, 1941; correction with title, *Eustephanella,* new name for *Eustephanus,* Swartz and Swain: Jour. Paleontology 16, p. 674, 1942. Forty species are recognized; four zones are identified, one of which is widespread. Descriptions of the Onondaga Formation are given from 12 localities. Sections are measured; fossils are illustrated.
13. Silurian and early Devonian studies in the middle Appalachians: New York Acad. Sci., Trans. 2nd ser. 4, p. 177-190, 1942; Pa. State College Mineral Industry Experiment Sta., Tech. Paper 76, 1942. The Silurian section is 4000 feet thick in eastern Pennsylvania and is largely from terrestrial sediments. Westward, numerous marine formations appear in the section, and the total thickness is thinner. The fossils of each formation are discussed. The top and bottom limits of the Silurian System are uncertain. Biofacies and lithofacies are considered.
14. (and Richardson, Eugene Stanley, Jr.). New structures in early Devonian Conularidae [abs.]: Geol. Soc. Amer., Bull. 56, p. 1206, 1945.
15. Revision of Synphoriinae with new trilobites from the Lower Devonian of Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 56, p. 1206, 1945.
16. Zonal Ostracoda of the Lower Devonian in New York and Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 56, p. 1204-1205, 1945.
17. Horse Shoe curve [field] trip: [Field Conf. of Pa. Geologists, 12th], 23 p. (#), illus., [n.p.] [1946]. This is a very detailed mimeographed itinerary of a field trip southward along the Allegheny Front along the horseshoe curve of the Pennsylvania Railroad. Devonian-Pennsylvanian strata are described.
18. General characters of the Paleozoic sediments from western to central Pennsylvania and to western New York, *in* Geology of the northern portion of the Appalachian basin, field trip, Amer. Assoc. Petroleum Geologists, Oct. 4-9, by G. C. Grow, ed.: p. 91-115, illus., Pittsburgh Geol. Soc., Pittsburgh, 1948. A comprehensive review of the Cambrian-Permian rocks in western Pennsylvania is given. The general features of each system are described.
19. Geologic aspect of petroleum exploration in Pennsylvania: Producers Monthly 12, no. 3, p. 21-27, 1948; Pa. State College Mineral Industry Experiment Sta., Bull. 48, p. 66-80, illus., 1948. A review of the various ways in which geology can be applied to exploration in the Commonwealth is given. Subsurface correlation, surface mapping, geophysical data, air photos, and paleogeography are discussed.

20. Late Ordovician and Silurian facies, conditions of deposition and paleogeography in north-central Appalachians [abs.]: Oil and Gas Jour. 47, no. 24, p. 90, 1948; Amer. Assoc. Petroleum Geologists, Bull. 32, p. 2160, 1948.

21. Trenton and sub-Trenton of outcrop areas in New York, [eastern] Pennsylvania, and Maryland, *in* Appalachian Basin Ordovician symposium, by J. T. Galey, ed.: Amer. Assoc. Petroleum Geologists, Bull. 32, p. 1493-1595, illus. incl. geol. maps, 1948; Pa. Geol. Survey 4th ser., G-22, 1948; Pa. State College Mineral Industry Experiment Sta., Tech. Paper 141, 1948. Precambrian-Ordovician rocks of eastern Pennsylvania are described. The Martic overthrust problem is outlined, and geophysical features are listed. Many correlations are made; sections are measured; fossils are listed. Each rock unit is compared with adjoining areas. The oil and gas possibilities are described.

22. [Stratigraphy, Ordovician-Mississippian]: Appalachian Geol. Soc., Bull. 1, p. 439-441, 449, 1949. This is a series of three cross sections showing the post late-Ordovician Paleozoic units in western Pennsylvania, primarily from Harrisburg to Pittsburgh and north into New York. A generalized columnar section is included.

23. Subsurface projection of the Cambro-Ordovician sediments in Pennsylvania-New York region and relation to oil and gas possibilities—[Part 1]: Producers Monthly 13, no. 11, p. 25-32, illus., 1949;—[Part 2]: no. 12, p. 28-31, illus., 1949:—[Part 3]: 14, no. 1, p. 25-31, illus., 1949;—[Part 4]: no. 2, p. 34-39, illus., 1949. Cambro-Ordovician rocks reach a maximum thickness of about 15,000 feet; they are: basal sands, medial limestones, and topmost shales and sand. The paleogeography is discussed. Correlations are made. The oil and gas possibilities of each unit are considered.

SWINGLE, R. J. See Snyder, H. N., 1.

TABER, THOMAS

1. Practical remarks on gems, especially on some of those found in the United States [Chester County]: Amer. Jour. Sci. 38, p. 61-68, 1840. Seventeen varieties of semi-precious stones are listed from the county, but with no specific localities. Quartz is mentioned from Lancaster County.

TALMAGE, STERLING B.

1. Some lead and zinc occurrences in eastern Pennsylvania: M.S. thesis, Lehigh Univ., 1923.

TAYLOR, FRANK BURSLEY

1. The great ice-dams of Lakes Maumee, Whittlesley, and Warren: Amer. Geologist 24, p. 6-38, illus., 1899. As the Wisconsin ice retreated, lakes formed between the ice and the terminal moraines. Lake Warren was present in the northwestern part of the Commonwealth. The dams (moraines) and resulting beaches are described.

TAYLOR, FRANK H.

1. The anticlinal theory: Oil and Gas Jour. 10, no. 10, p. 2, 1911. This is a historical note about Maj. Gen. A. J. Warner [d. 1910] who is the first to suggest the possibility of anticlinal control of petroleum. While most of his interest was in Ohio and West Virginia, some of his observations were in the Commonwealth.

TAYLOR, RICHARD COWLING, 1789-1851. See also Weaver, Thomas, 1.

1. Section of the Alleghany Mountain and Moshannon Valley, in Centre County, Penn.: Monthly Amer. Jour. Geology 1, p. 433-438, illus., 1832. A cross section shows attitudes of beds where they are exposed along a traverse. [Ordovician]-[Pennsylvanian] rocks are discussed. The coal beds are listed. Fossils are mentioned but not listed. The change from folded rocks to those of the plateau, which are flat-lying, is noticed.

2. A description of a fossil vegetable of the family Fucoides in the transition rocks of [Mifflin County] North America, and some considerations in geology connected with it: Mag. Nat. Hist. 7, p. 27-32, 163, illus., London, 1834. *Arthrophycus* is illustrated and described from [Silurian] rocks near Lewistown and elsewhere.

3. On the geological position of certain beds which contain numerous fossil marine plants of the family Fucoides; near Lewistown, Mifflin County, Pennsylvania: Geol. Soc. Pa., Trans. 1, p. 5-15, 175, illus., 1834. *Fucoides alleghaniensis* are described and illustrated *in situ* from the [Tuscarora] sandstone. They are

very common in certain beds. The structure of the general region is also discussed.

4. Notice as to the evidences of the existence of an ancient lake, which appears to have formerly filled the limestone valley of Kishacoquillas, in Mifflin County, Pennsylvania: Geol. Soc. Pa., Trans. 1, p. 194-203, illus., 1835. A ledge on both sides of the valley suggests an ancient beach. The lake was over 300 feet deep at the center. It drained when an earthquake caused a rift in the mountain. No lake deposits are evident, and no age relationships are suggested.
5. On the geology and natural history of the northeastern extremity of the Allegheny Mountain Range in Pennsylvania, United States: Mag. Nat. Hist. 8, p. 529-541, London, 1835. A geologic description of the area in northern Pennsylvania is given. [Cambrian]-[Pennsylvanian] rocks are described. The coal beds are also discussed.
6. On the mineral basin or coal field of Blossburg, on the Tioga River, Tioga County, Pennsylvania: Geol. Soc. Pa., Trans. 1, p. 204-219, illus., 1835. A general economic description of the area is given. Coals are described; iron ore, manganese, limestone, fire clay, and sandstone are also mentioned. There are 6,000 tons of mineral wealth per acre.
7. On the relative position of the transition and secondary coal formations in Pennsylvania, and description of some transition coal or bituminous anthracite, and iron ore beds near Broad Top Mountain, in Bedford County, and of a coal vein in Perry County, Pennsylvania, with sections: Geol. Soc. Pa., Trans. 1, p. 177-193, illus., 1835. The Broadtop basin coals are assigned to the [Devonian] on the basis of superposition. [Erroneous] sections are presented to support the idea. Examples of the coal are described and analyzed. A [Devonian] shaly coal bed is described from Perry County. Plants associated with it are listed. Hematite and limonite are mentioned and briefly described; they are residual.
8. Notice of a model of the western portion of the Schuylkill or southern coal field of Pennsylvania: Amer. Jour. Sci. 41, p. 80-91, illus., 1841; Assoc. Amer. Geologists, Rpt., p. 81-94, illus., 1843. Three-dimensional models are described, showing the structures in the coal fields.
9. Notice of fossil arborescent ferns, of the family of Sigillaria and other coal plants, exhibited in the roof and floor of a coal seam in Dauphin County, Pennsylvania: Amer. Phil. Soc., Trans. ns 9, p. 219-227, illus., 1846. Very large specimens of plants are described. Preservation is poor and specific identification cannot be determined, but most seem to be related to *Sigillaria*. Some of the specimens are 70 feet long and are probably trunks of trees. At least 23 different kinds of plants are present.
10. Statistics of coal . . . : cxlvii, 754 p., illus., Philadelphia, 1848; 2nd ed., revised by S. S. Haldeman, 641 p., Philadelphia, 1855. A complete monograph includes geological discussions of the world's coal beds, including the Commonwealth's. Paleobotanical correlations are also included. Individual areas are discussed in detail.

TAYLOR, RUSSEL N. See Mills, John Ross, 1.

TAYLOR, T. G. See Moore, Elwood S., 4.

TAYLOR, W. J.

1. Notices of two minerals from the Lancaster [Lancaster County], Pa., zinc mines: Amer. Jour. Sci. 2nd ser. 20, p. 412, 1855. Tennantite and buratite from the Bamford area are described by physical properties.
2. Pseudomorphs of smithsonite [Lancaster County]: Amer. Jour. Sci. 2nd ser. 21, p. 427, 1856. Pseudomorphs of smithsonite after dolomite from the Bamford area are mentioned.
3. Mineralogical notes [Schuylkill and Lancaster Counties]: Acad. Nat. Sci. Phila., Proc. [10] 1858, p. 172-176, 1859. A reference is made to the presence of vauquelinite from the Pequea mine. It is described chemically and physically. Pyrophyllite from the anthracite area is described.

TESCHEMACHER, JAMES ENGLEBERT, 1790-1853

1. [Ferns from the anthracite [?] coal mines at Mansfield, Tioga County] [abs.]: Boston Soc. Nat. Hist., Proc. 1, p. 61-62, 1844; discussion by C. T. Jackson, p. 62.

2. On the fossil vegetation of America [Lackawanna County],—[Part 1]: Boston Jour. Nat. Hist. 5, p. 370-385, 1847;—[Part 2]: Amer. Jour. Sci. 2nd ser. 3. p. 86-90, illus., 1847. Part one is mostly philosophical and includes a list of plants known from North America. In Part 2, coal plants from the anthracite area near Carbondale are described.
3. [Coniferous plants during the coal period and on the resinous nature of coal]: Boston Soc. Nat. Hist., Proc. 4, p. 199-202, 1854. Examples are taken from the Commonwealth to support the idea that the [Pennsylvanian] trees were coniferous. It is based on resin similarities between living pines and the fossil coal plants.

THEISS, MARY ELIZABETH

1. The fauna of the Ames limestone in the Pittsburgh quadrangle [Allegheny County]: M.S. thesis, Univ. of Pittsburgh, 1940.

THIESSEN, REINHARDT, 1867-1938.

1. (and Voorhees, Anson W.). A microscopic study of the Freeport coal bed, Pennsylvania: Carnegie Inst. Tech., Coal-Mining Inv., Bull. 2, 75 p., illus., Pittsburgh, 1922. Many thin sections are illustrated, and zones within the coal are recognized and correlated.
2. (and Staudd, J. N.). Correlation of coal beds in the Monongahela formation of Ohio, Pennsylvania, and West Virginia: Carnegie Inst. Tech., Coal-Mining Inv., Bull. 9, 64 p., illus., Pittsburgh, 1923. Physical features, organic content, petrography, and other factors are used to show the equivalence of coal beds.
3. (and Ford, Wilson E.). Correlation of coal beds of the Allegheny formation of western Pennsylvania and eastern Ohio: Carnegie Inst. Tech., Coal-Mining Inv., Bull. 10, 56 p., illus., Pittsburgh, 1924. Coals are correlated primarily on the basis of petrography and spore analyses.
4. The microscopic structure of coals of the Monongahela series: W. Va. Acad. Sci., Proc. 3, p. 159-198, illus. [1930]; W. Va. Univ. Bull., ser. 30, no. 1 [1930]. The Pittsburgh, Redstone, and Sewickley coals are described petrographically from various places, mostly Washington County.

THOM, WILLIAM TAYLOR, JR.

1. Position, extent, and structural makeup of Appalachia: Geol. Soc. Amer., Bull. 48, p. 315-321, illus., 1937. Gravity surveys of the east coast area, including the Commonwealth, are shown. The nature of submerged Appalachia is interpreted in part, and further tests are suggested.

THOMAS, CHARLES A.

1. Fluorescence on iron-stone shales near Pottstown [Bucks County], Pennsylvania: Rocks and Minerals 21, p. 273, 1946. Red calcite is fluorescent on [Brunswick?] shale. No other data are given.
2. Fluorescent minerals of Kibblehouse quarry [Montgomery County]: Rocks and Minerals 21, p. 83, 1946. Calcite, epidesmine, and natrolite are reported as fluorescent.
3. Graphite mine in Chester County, Pennsylvania: Rocks and Minerals 21, p. 415, 1946. Limonite, quartz, ceruleolactite, and serpentine are reported from the now-abandoned pits. Graphite is very rare in the schist.
4. Red crystals on Wheatley sphalerite [Chester County]: Rocks and Minerals 21, p. 279, 1946. Zincite ? may be present as a secondary mineral.
5. The Dyer quarry [Berks County]: Rocks and Minerals 21, p. 142-143, 205-206, 278-279, 1946. Fluorescent, green calcite, prehnite, apophyllite, heulandite, chabazite, laumontite, melaconite, and stilbite are reported from diabase quarries.
6. The Friedensville [Lehigh County] zinc mines again: Rocks and Minerals 21. p. 348, 358, 1946. Zinc-bearing calcite and many other minerals are mentioned from the zinc mines.
7. Kibblehouse quarry [Montgomery County] again: Rocks and Minerals 22. p. 803-804, 1947. Zeolites, fluorescent calcite and epidote are described from the quarry.
8. Wheatley [Chester County] area micros: Rocks and Minerals 22, p. 307-309, 1947. Fluorescent microcrystals are reported from the old mine area. They are anglesite, pyromorphite, quartz, cerussite, and others.
9. Dyer's apophyllite [Chester County]: Rocks and Minerals 23, p. 914-915, 1948. Diabase cavities contain prehnite and apophyllite.

10. New Friedensville zinc mine [Lehigh County]: Rocks and Minerals 23, p. 705-706, 1948. A list of minerals from the old Friedensville mines is given.

THOMAS, DAVID. See also Eaton, Amos, 1.

1. Diluvial furrows and scratches [Susquehanna County]: Amer. Jour. Sci. 17, p. 408, 1830. Scratches on rocks, over 1000 feet above the nearby New York examples, are mentioned from the Montrose-Milford Turnpike, south of the great bend of the Susquehanna River. They are attributed to the Deluge.

THOMAS, J. P.

1. The anthracite region of Pennsylvania: Compass 19, p. 262-264, 1939. A brief review of the region includes no details.

THOMAS, N. WILEY. See Smith, Edgar Fohs, 1.

THOMSON, THOMAS

1. Chemical examination of some minerals, chiefly from America . . . : Lyceum Nat. Hist. New York, Annals 3, p. 9-86, 1828; correction *in* Identity of . . . bucholzite . . . , by B. Silliman, Jr.: Amer. Assoc. Adv. Sci., Proc. 2, p. 111, 1849. Bucholzite from Delaware County is described physically and chemically. Silliman claims that it is kyanite.
2. Bucholzite. [Delaware County] no. 12 *of* Account of constituents of various minerals: Roy. Soc. Edinburgh, Trans. 11, p. 244-272, 1831. Bucholzite from near Chester is described and analyzed.

THOMPSON, HENRY DEWEY

1. Drainage evolution in the Appalachians of Pennsylvania: New York Acad. Sci., Annals 52, p. 31-62, illus., 1949. The original west-flowing streams in the Appalachians have been turned eastward by capture. The main watershed has migrated westward from its early location in Appalachia to the Plateau where it is presently. The regional slope has been changed accordingly. The structure has affected the stream courses considerably.
2. Structure-drainage relations in the Appalachian Mountains: New York Acad. Sci., Trans. 2nd ser. 12, p. 3-5, 1949. A review of the various hypothesis of the origin of Appalachian drainage is given.

THOMPSON, MARCUS LUTHER. See Moore, Raymond Cecil, 6.

TIGNOR, E. M. See Fettke, Charles Reinhard, 29.

TITCOMB, JANE. See Averitt, Paul, 2.

TOMLINSON, W. H.

1. The Perkiomen [Montgomery County] copper mines: Mineral Collector 9, p. 118-121, 1902. This is a popular account of the minerals found at this famous location.

TOMLINSON, W. HAROLD. See also Meier, Adolph E., 1, 2.

1. (and Meier, Adolph E.). On the origin of montmorillonite [Delaware County]: Amer. Mineralogist 22, p. 1124-1127, illus., 1937. Montmorillonite as a weathering product is described. It occurs in gabbroid material and as an alteration product of plagioclase. Meta-pyroxenite occurs nearby, and meteoric water reaching the gabbroid area must pass through it, picking up magnesium which then attacks the plagioclase and alters it to the clay.
2. Corundum in a dike at Glen Riddle [Delaware County], Pa.: Amer. Mineralogist 24, p. 339-343, illus., 1939. Corundum may have formed in anorthositic gabbro dikes by high-temperature volatile reactions on calcic plagioclases.
3. Triassic dikes of basaltic glass at Safe Harbor [Lancaster County], Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 51, p. 2009, 1940.
4. Idiomorphic cordierite from Safe Harbor [Lancaster County], Pennsylvania: Amer. Mineralogist 27, p. 646-648, illus., 1942. This is the first reported occurrence of this variety in Pennsylvania. It occurs in a brecciated zone in highly micaceous schist, possibly the Harpers (Cambrian) Formation. The zone was intruded during the Paleozoic and contact metamorphosed during the Triassic.
5. Occurrence of sodic scapolite at Falls of French Creek [Chester County], Pennsylvania: Amer. Mineralogist 28, p. 110-114, illus., 1943. Sodic scapolite occurs in veins composed of late-crystallizing material from Triassic diabase magma. Prehnite and heulandite and others are associated. The high percentage of chlorine in the vein seems to be the principal factor in determining the occurrence scapolite rather than albite

6. Notes on the derivatives of the Triassic diabases of Pennsylvania: Economic Geology 40, p. 526-536, illus., 1945. Diabase magma was mixed basaltic and assimilated acidic material. The two differentiated during crystallization. Basaltic magma, near the surface, retained 6 percent acidic material and is called diabase. When more acid material is present, diabase pegmatite and albitic pegmatite are formed. The iron ore could have been derived from the acid material if it were high in ferric iron. Analyses are given.
7. Assimilation (?) of micaceous schist by diabase [Lancaster County] [abs.]: Geol. Soc. Amer., Bull. 60, p. 1924-1925, 1949.

TOOKER, EDWIN W.

1. Barite deposits near Buckmanville [? Franklin County], Pennsylvania: M.S. thesis, Lehigh Univ., 1949.

TORBERT, JOHN B.

1. (and McGee, W J). Geological map of the United States showing the distribution of Pleistocene ice-work and water-work so far as known: Scale, 1:15,000,000, in Johnson's Universal Cyclopedia 3, p. 730, New York, 1894; geologic map also included.

TORRY, JOHN

1. (and Brush, George Jarvis, and Cook, Josiah Parsons). On a variety of galena from Lebanon County, Pennsylvania: Amer. Jour. Sci. 2nd ser. 35, p. 126-129, 1863, Argentiferous galena shows strong octahedral cleavage and is interpreted as a pseudomorph after fluorite.

TORRY, JOSEPH, JR. See Barbour, Erwin Hinckley, 1.

TORRY, PAUL DWIGHT. See also Caster, Kenneth Edward, 7; Newby, Jerry B., 1.

1. The possibilities of mining for petroleum in the Appalachian oil fields: Pa. State College Mineral Industry Experiment Sta., Bull. 9, p. 19-25, 1930; discussion by W. R. Chedsey, p. 25-26. A discussion of the history of oil mining and various techniques includes possibilities in the Commonwealth. The sands would have to be near the surface and be exhausted by drilling to be economical. The third Venango sand is cited as an example.
2. Natural gas from Oriskany formation in central New York and [Tioga County] northern Pennsylvania: Amer. Assoc. Petroleum Geologists, Bull. 15, p. 671-688, illus., 1931. Gas in the Oriskany sandstone is controlled by: (1) structure and (2) the irregularities in deposition. The gas occurs in porous areas which were probably submarine bars not subject to rapid currents. Well logs are given.
3. (and others). The geology of New York and northern Pennsylvania: Amer. Petroleum Inst., Division of Production, Paper no. 826-4A, 19 p., illus., Dallas, Tex., 1932. This is a complete discussion of the structure, stratigraphy. and geological history of the northern tier of counties west of the Delaware River. Cross sections are included. Cambrian-Pennsylvanian rocks are discussed. Taconic and Appalachian folding is evident.
4. Composition of oil-field waters of the Appalachian region, *in* Problems of petroleum geology, Powers Mem. vol.: p. 841-853, illus., Amer. Assoc. Petroleum Geologists, Tulsa, 1934. Connate waters occur in: (1) synclines, due to gravity separation of oil and gas, (2) the lower parts of reservoirs, and (3) association with the oil. The salt concentration is greater than recent sea water. Examples are drawn from the Commonwealth. Devonian-rock water is more concentrated than is Mississippian- or Pennsylvanian-rock water.
5. Origin, migration, and accumulation of petroleum and natural gas in Pennsylvania, *in* Problems of petroleum geology, Powers Mem. vol.: p. 447-487, illus., Amer. Assoc. Petroleum Geologists, Tulsa, 1934. Oil and gas have a vegetable and animal origin. The reservoir beds are near the source beds. The migration occurred shortly after the close of the Mississippian Period. Four types of traps are recognized: (1) oil, gas, and water mixtures, (2) reservoir cementation control, (3) reservoir permeability control, and (4) anticlinal traps. Some examples are given.
6. Summary of geology of natural-gas fields of New York and Pennsylvania, *in* Geology of Natural gas, by H. E. Ley, ed.: p. 949-988, illus., Amer. Assoc. Petroleum Geologists, Tulsa, 1935. The important gas horizons in the Com-

monwealth are in near-shore deposits of Paleozoic age in the plateau province. The stratigraphy is described. Reservoir characteristics are more important than structure in the traps. The carbon ratio of the coals serves as a clue in gas prospecting. The reserves are large. Individual fields are discussed by reservoir age.

TOWER, WALTER SHELDON

1. Regional and economic geography of Pennsylvania—Part 1, Physiography: Geog. Soc. Phila., Bull. 4, no. 2, p. 9-28, 1906; no. 3, p. 1-24; no. 4, p. 12-36; no. 5, p. 25-35, 1906. The physiography and glaciation of the Commonwealth is described in detail.

TOWNSEND, WILLIAM P.

1. A report on the minerals of Chester County, that are used in the arts, read before the West Chester Lyceum, March 30, 1839; 10 p., West Chester, [1839] [not seen, see Miller, B. L., Graphite deposits of [southeastern] Pennsylvania, 1912, p. 129].

TRAVIS, CHARLES

1. Pyrite from Cornwall, Lebanon Co., Pa.: Amer. Phil. Soc., Proc. 45, p. 131-148, illus., 1906. Crystallographic studies of the various kinds of pyrite crystals are made. They are: (1) a combination of (111) and (100) without a reference, (2) a combination of (100), (111), (210), (321), (432), and (221) containing 2 percent cobalt, and (3) another variety with no forms given but which contains 2.4 percent copper.

TREGO, CHARLES B. See also Hodge, James Thatcher, 1.

1. A geography of Pennsylvania . . . : 384 p., Philadelphia, 1843. A very brief review of the stratigraphy of the Commonwealth is included.
2. [Observations on the iron ore deposits of Buckingham Mt., Bucks County] [abs.]: Amer. Phil. Soc., Proc. 13, p. 264, 1873; discussion [abs.] by J. P. Lesley, p. 264.

TROEDSSON, GUSTAF T.

1. Charles D[oolittle] Walcott [1850-1927]: Geol. Föreningens i Stockholm, Förh. 49, p. 290-292, port., 1927.

TROOST, GERARD, 1776-1850.

1. Geological survey of the environs of Philadelphia [Philadelphia-Chester Counties]: 40 p. [illus. geol. map], H. S. Tanner, Philadelphia, 1826; discussion by G. P. Merrill; Science ns 12, p. 884, 1900; Amer. Geologist 26, p. 391-392, 1900; discussion by S. H. Hamilton, 27, p. 41-42, 1901. A cursory description of the geology and mineralogy within a 15-mile radius of the city is given. Rocks are described but no ages are assigned. The map is discussed by later authors as it was not printed with the original report.

TROWBRIDGE, ARTHUR CARLETON

1. Frank Leverett, 1859-1943: Iowa Acad. Sci., Proc. 51, 1944, p. 113-114, port. [1945].

TRYON, F. G.

1. (and McKenney, W. F.). Producing coal districts of the United States, 2 sheets: Map, scale, 1:2,500,000 (1 inch equals 40 miles), U. S. Geol. Survey, 1922.

TSCHERMAK, G.

1. Die Chloritgruppe: Kaiserl. Akad. Wissenschaften, Math.-Nat. Klasse, Sitzungsb. 99, abt. 1, p. 174-267, illus., 1891; 100, abt. 1, p. 29-107, illus., Vienna, 1891. In a treatise on the chlorite group, which includes optical, chemical, and crystallographic data, many examples are described and analyzed from the Commonwealth. Kotschubeite [clinochlore] and kämmererite are described and analyzed from Texas, Lancaster County.

TURNER, HOMER GRIFFIELD

1. Constitution and nature of Pennsylvania anthracite with comparisons to bituminous coal: Amer. Inst. Mining and Metallurgical Engineers, Tech. Pub. 234, 17 p., illus., 1929; Lehigh Univ. Pub. 3, no. 11; Inst. Research, Circ. 35 [Sci. Tech. 28], 15 p., illus., 1929. The coals are described and compared petrographically. They are almost identical morphologically.
2. Correlation of Pennsylvania anthracite: Pa. Acad. Sci., Proc. 4, p. 104-107, 1930. Several correlation techniques are discussed; none is satisfactory. They

are: plant impressions, cross sections, interbedded rocks, ash colors, and morphology of the coal.

3. Bacteria in [Schuylkill County] Pennsylvania anthracite (?): Science ns 76, p. 121-122, 1932. An argument against an idea that bacteria in anthracite coal are derivatives of those entrapped during the coal formation. Sources of modern bacterial contamination of anthracite are discussed.

TUTTLE, ORVILLE FRANK. See also Krynine, Paul Dimitri, 5, 7.

1. Heavy minerals of the Ordovician-Silurian boundary in central Pennsylvania: M.S. thesis, Penn. State College, 1940; Pa. Acad. Sci., Proc. 14, p. 55-59, illus., 1940; Pa. State College Mineral Industry Experiment Sta., Tech. Paper 63, illus., 1940. The heavy minerals from the Juniata and Oswego Formations are similar, whereas those from the Juniata and Tuscarora Formations differ greatly. The source area during Ordovician time was composed largely of slate and phyllite; Cambrian quartzite was predominant in the source area of the Tuscarora Formation.

UHRIG, LEONARD F.

1. Tangential arcs applied to Appalachian folds [abs.]: Geol. Soc. Amer., Proc. 1933, p. 114-115, 1934.

ULKE, TITUS

1. Notes on minerals found in and about the Cornwall mine [Lebanon County], Pa.: Rocks and Minerals 13, p. 213, 1938. A brief resumé of the geology includes a discussion of magnetite, pyrite, chalcopyrite and other minerals which are found.

[ULMER, L. J.]

1. [and Heckman, Oliver S., and Foose, Richard Martin]. [Geology in the vicinity of Lock Haven, Clinton County]: Field Conf. of Pa. Geologists, 10th, 6 p. (#), Lock Haven, 1940. A road log and itinerary visiting Ordovician-Pennsylvanian, and Pleistocene outcrops is given. No details are included.

ULRICH, EDWARD OSCAR, 1857-1944. See also Bassler, Ray Smith, 1.

1. (and Schuchert, Charles). Paleozoic seas and barriers in eastern North America: New York State Museum, Bull. 52, p. 633-663, illus., 1902. A detailed discussion of the paleogeography of the eastern United States includes the Commonwealth. Various sea-invasion routes and land masses are described.
2. (and Bassler, Ray Smith). New American Paleozoic Ostracoda—preliminary revision of the Beyrichiidae, with descriptions of new genera: U. S. Natl. Museum, Proc. 34, p. 277-340, illus., 1908. In a detailed paleontological study, specimens from various ages and parts of the Commonwealth are included.
3. Revision of the Paleozoic systems: Geol. Soc. Amer., Bull. 22, p. 281-680, illus., 1911; Index, 24, p. 625-668, 1913. Worldwide observations suggest that the Ozarkian and Canadian Systems should be inserted between the Cambrian and Ordovician Systems. Paleogeography is included; southeastern Pennsylvania is involved. The Commonwealth in general is discussed from the regional viewpoint. The Ozarkian Period [Epoch] in the Commonwealth is represented by the Allentown limestone; the Canadian Period [Epoch] is representd by the Beekmantown limestone. Both are discussed completely. Also included in the Canadian System [Epoch] are the upper Stones River, Bellefonte, Axemann, Nittany, and Stonehenge Formations of central Pennsylvania. Fossils are listed; sections are measured.
4. The Medina problems [abs.]: Geol. Soc. Amer., Bull. 24, p. 107-108, 1913.
5. The Ordovician-Silurian boundary: Internatl. Geol. Cong., 12th, Toronto 1913, C. R., p. 593-667, illus., Ottawa, 1914; advance copy, 1913. The subject is considered as an international problem, with examples drawn from the Commonwealth. Paleontological evidence, as well as physical evidence, is used.
6. (and Bassler, Ray Smith). American Silurian formations: Md. Geol. Survey, Silurian, p. 233-270, illus., 1923. This is a general discussion of the Silurian correlation problems. New York and Maryland sections are compared with the Commonwealth. No details are given.
7. (and Bassler, Ray Smith). Paleozoic Ostracoda—their morphology, classification, and occurrence: Md. Geol. Survey, Silurian, p. 271-391, illus., 1923. Silurian sections in Juniata and Huntingdon Counties are measured, and the ostracode fauna is listed.

UNGER, CLAUDE W.

1. An account of the various contributions made to the knowledge of the fossil flora of the southern anthracite coal field and the adjacent Paleozoic formations in Pennsylvania, with a list of the fossil plants: Hist. Soc. Schuylkill Co., Pub. 2, p. 50-102, 1907. A brief history of geologists and naturalists who mentioned fossil flora from this area is given. A catalog of genera and species is included. Locations are obscure.

UNKLESBAY, ATHEL GLYDE. See Miller, Arthur Keith, 5.

U. S. GEOLOGICAL SURVEY

1. Miscellaneous analyses of coal samples from various fields of the United States: U. S. Geol. Survey, Bull. 471, p. 629-655, 1912; Bull. 531, p. 331-355, 1913. Tables of proximate and ultimate analyses of various coals from Washington, Somerset, and Sullivan Counties are given.

UPHAM, WARREN. See also Chamberlin, Thomas Chrowder, 3.

1. Prof. Henry Carvill Lewis [1853-1888] and his work in glacial geology: Amer. Geologist 2, p. 371-379, port., 1888.
2. Memorial of Charles Henry Hitchcock [1836-1919]: Geol. Soc. Amer., Bull. 31, p. 64-80, port., 1920.
3. Memorial of George Frederick Wright [1838-1921]: Geol. Soc. Amer., Bull. 33, p. 15-30, port., 1922.

VANARTSDALEN, JOHN F.

1. Minerals of southern Bucks County, Pa.: Mineral Collector 9, p. 42-43, 1902. A popular account of a large number of minerals available from a great many places in the county is given.
2. The Vanartsdalen quarry [Bucks County]: Mineral Collector 8, p. 186-187, 1902. A limestone quarry containing a host of metamorphic minerals is described.
3. Blue quartz of Bucks Co., Pa.: Mineral Collector 10, p. 77-78, 1903. Blue quartz occurs as veins in [Precambrian] gneiss and also as disseminated angular fragments. Most of it is fractured, and some contains inclusions. No locations are included.

VAN HISE, CHARLES RICHARD, 1857-1918.

1. Correlation papers—Archean and Algonkian: U. S. Geol. Survey, Bull. 86, 549 p., illus., 1892. A detailed report of Precambrian rocks of North America includes only an annotated bibliography of those of the Commonwealth.
2. (and Leith, Charles Kenneth). Pre-Cambrian geology of North America: U. S. Geol. Survey, Bull. 360, 939 p., illus., 1909. The Commonwealth is included. The literature is reviewed. The Precambrian rocks are highly metamorphosed. The Baltimore gneiss is the oldest rock and is overlain by crystalline schists, the whole being intruded by acid and basic rocks. The volcanic rocks in the Blue Ridge are also discussed.

VAN HORN, F. R. See White, Israel Charles, 26.

VAN INGEN, GILBERT

1. Stratigraphic observations in the vicinity of Susquehanna Gap [Dauphin County], north of Harrisburg, Pa. [abs.]: Science ns 27, p. 764, 1908.
2. The stratigraphic position of the oolitic iron-ore at Bloomsburg [Columbia County], Pa. [abs.]: Science ns 29, p. 830, 1909.
3. Shore and off-shore deposits of Silurian age in Pennsylvania [abs.]: Science ns 33, p. 905, 1911.

VAN ORSTRAND, CHARLES EDWIN

1. Apparatus for the measurement of temperatures in deep wells and temperature determinations in some deep wells in [Washington-Greene Counties] Pennsylvania and West Virginia: W. Va. Geol. Survey, Barbour and Upshur Counties, p. lxvi-ciii, illus., 1918. Temperature increases are recorded along with other well-log data; the increase with depth is noted.
2. Temperatures in some deep wells in the United States [abs.]: Wash. Acad. Sci., Jour. 9, p. 382, 1919.

VAN RENSSELAER, JEREMIAH

1. On the fossil tooth of an elephant found near the shore of Lake Erie [Erie County] . . .: Amer. Jour. Sci. 14, p. 31-33, 1828. A mastodon tooth from Beaverdam is described.

VAN TUYL, FRANCIS MAURICE

1. (and Berckhemer, Fritz). A problematic fossil from the Catskill formation [Monroe County]: Amer. Jour. Sci. 4th ser. 38, p. 275-276, illus., 1914. *Rectogloma problematica* is described from the Catskill Formation. It resembles an abnormal cephalopod externally but not internally. It has a small coil followed by a fat, sutured tube.

VANUXEM, LARDNER

1. Experiments in anthracite, plumbago, etc.: Acad. Nat. Sci. Phila., Jour. 5, p. 17-27, 1825. Experiments for purity are run on a piece of Carbon County anthracite, among other things.
2. Analyses of cyanite and fibrolite, and their union in one species, under the name of disthene [Philadelphia County]: Acad. Nat. Sci. Phila., Jour. 6, p. 41-45, 1829. A specimen of fibrolite is reanalyzed and considered to be [kyanite].

VAUGHAN, THOMAS WAYLAND

1. The work of Joseph Barrell [1869-1919] in sedimentation: Geol. Soc. Amer., Bull. 34, p. 28-44, 1923.

VAUX, GEORGE, JR.

1. Some unusual quartz pseudomorphs from the Hopewell mine, Warwick Township, Chester County, Pennsylvania: Acad. Nat. Sci. Phila., Proc. 78, 1926. p. 17-19, illus., 1927. Pseudomorphs of quartz after datolite are described and illustrated.
2. The mines at the falls of French Creek, Chester County, Pennsylvania: Amer. Mineralogist 13, p. 25-29, 1928. A brief description of the geology of the area is followed by a list and description of the minerals known to occur there. Pyrite, chalcopyrite, calcite, byssolite, garnet and anthophyllite are described.

VEATCH, ARTHUR CLIFFORD. See Fuller, Myron Leslie, 9.

VER STEEG, KARL. See also Ashley, George Hall, 56; Meyerhoff, Howard Augustus, 2.

1. Certain characteristics of peneplains. Pan-Amer. Geologist 52. p. 340-342, 1929. The irregularities on peneplain surfaces can be due to slopes toward divides on the original surface. Thickness and breadth of outcrop are some of the factors causing such irregular high areas on the peneplain. Examples are drawn from the Commonwealth.
2. Relation of wind gaps and water gaps to peneplanation [abs.]: Ohio Acad. Sci., Proc. 8, p. 405-406, 1930.
3. Wind gaps and water gaps of the northern Appalachians, their characteristics and significance: New York Acad. Sci., Annals 32, p. 87-220, illus., 1930. Profiles show only one peneplain, the Schooley, which has been warped. Wind gaps do not seem to mark intervals of rest during the rejuvenation, as their trough elevations vary considerably. The water gaps are more v-shaped than the wind gaps; this is probably due to continued downcutting. The old Schooley surface dips slightly toward each gap, suggesting superposition.
4. Erosion surfaces of the Appalachians: Pan-Amer. Geologist 56, p. 267-284, illus., 1931. The Schooley and Harrisburg peneplains are correlated with similar surfaces throughout the southern Appalachians.
5. Warping of Appalachian peneplains: Jour. Geology 39, p. 386-392, illus., 1931. Contours drawn on the Harrisburg peneplain show it sloping gradually northwestward and toward streams. There is no indication of warping. It seems to have been vertically uplifted. Wind-gap formation occurred mostly during Harrisburg surface erosion interval.
6. Erosion surfaces of the Appalachian Plateau: Pan-Amer. Geologist 58, p. 31-44, illus., 1932. The Harrisburg surface is recognized in western Pennsylvania. The Kittatinny peneplain is considered to be tops of divides on the old Schooley surface. The Allegheny peneplain is correlated with the Harrisburg surface. Evidence for warping is presented.
7. Map of the Schooley (Kittatinny) peneplain: Jour. Geology 40, p. 557-559, illus., 1932. A structure contour map of the restored peneplain is produced from the evencrested ridges of eastern Pennsylvania. It rises gently northwestward, with some "domes" in the central part of the Commonwealth.

8. Some features of Appalachian peneplains: Pan-Amer. Geologist 53, p. 359-364, 1934; 54, p. 17-28, illus., 1935. The Schooley and Harrisburg peneplains are recognized at many different locations and at many different elevations. The many different elevations are interpreted as undulations and divides on the original surfaces rather than unequal warping.
9. Peneplanes and peneplanation: Pan-Amer. Geologist 65, p. 266-269, 1936. In realizing that a perfect plane could never occur in nature, the existence of a large number in the Commonwealth is doubted. Many are considered to be irregularities on the three erosion surfaces which are evident, the Somerville, Harrisburg, and the Schooley.
10. Correlation of erosion surfaces in western Pennsylvania and eastern Ohio [abs.]: Geol. Soc. Amer., Bull. 50, p. 1990-1991, 1939.
11. Correlation of Appalachian peneplains: Pan-Amer. Geologist 73, p. 203-210, illus., 1940. The large number of peneplains are mentioned and explained as being only two, the Schooley and Harrisburg. The great number of levels can be shown to result from warping of the two. The Worthington peneplain is correlated with the Harrisburg and the Kittatinny peneplain is considered the Schooley.
12. Geomorphology of the Catoctin belt: Amer. Jour. Sci. 238, p. 685-709, illus., 1940. The study is in the Blue Ridge area of Maryland primarily, but does include the Commonwealth in part. The Weverton peneplain has a regional slope and a local slope toward the many gaps. Differences in rock resistance and outcrop breadth can explain the many levels. There is no definite evidence of post-Weverton (Schooley) peneplains.

VER WEIBE, WALTER AUGUST

1. The Berea formation of Ohio and Pennsylvania: Amer. Jour. Sci. 4th ser. 42, p. 43-58, illus., 1916. The Berea Formation lies unconformably over the Bedford shale, which is thereby Devonian. Sections are measured and correlations are made. The Berea sand is considered to be the Murrysville or Butler gas sand. The Berea Formation is called the Corry sandstone and the Cussawago shale and sandstone in the Commonwealth. The Corry sandstone thickens eastward and becomes coarser. The Cussawago limestone is generally below it. The Cussawago sandstone thins eastward.
2. Correlation of the Devonian shales of Ohio and Pennsylvania: Amer. Jour. Sci. 4th ser. 44, p. 33-47, illus., 1917. The Upper Devonian shales decrease in thickness from 2700 feet in western Pennsylvania to 750 feet in central Ohio. The correlations suggest that the Hamilton, Portage, and lower Chemung Formations pass into the Chagrin shale; the upper Chemung Formation becomes the Cleveland shale; and the Conewago and Knapp Formations correlate with the Venango sandstone. The Venango and Riceville Formations correlate with the Bedford shale.
3. Correlation of the Mississippian of Ohio and Pennsylvania: Amer. Jour. Sci. 4th ser. 43, p. 301-318, illus., 1917. The various post-Berea formations in the northwest part of the Commonwealth are described, as are those in Ohio. Correlations are made. The Berea Formation is considered as the base of the Mississippian System. Sections are measured.
4. The Devono-Carboniferous boundary rocks of Ohio, Pennsylvania, and New York: Ph.D. thesis, Cornell Univ., 1918.
5. Tectonic classification of oil fields in the United States: Amer. Assoc. Petroleum Geologists, Bull. 13, p. 409-440, illus., 1929. The Appalachian geosyncline province, which includes the Commonwealth, is reviewed stratigraphically and the relations of the petroleum to the rocks are briefly discussed. The various types of traps are described.
6. Oil fields in the United States: 629 p., illus., McGraw-Hill, New York, 1930. The oil fields of the Commonwealth are included in a discussion of the Appalachian Geosyncline Province. The general column and relation of petroleum to structure are considered. No new data are included.
7. Present distribution and thickness of Paleozoic systems: Geol. Soc. Amer., Bull. 43, p. 495-540, illus., 1932. Isopach maps of each of the Systems in the United States, including the Commonwealth, are shown with a brief, generalized text accompanying them.

8. Present distribution and thickness of Mesozoic systems: Geol. Soc. Amer., Bull. 44, p. 827-864, illus., 1933. A generalized description of the Mesozoic of the U.S. includes a brief, very generalized description of the distribution of the Triassic in the Commonwealth.
9. Oil fields in North America: iv, 251 p. (#), illus., Edwards Bros., Wichita, Kansas, 1949. This is an account of the occurrence of oil in the many districts of North America. The Appalachian Geosyncline Province, of which Pennsylvania is a part, is included. A very generalized description of the petroleum stratigraphy and structure is given. A brief description of the properties and distribution of some of the more important sands is also included. No new information is added.

VICAIRE, A.

1. Les gisements pétrolifèras des États Unis: Soc. de l'Industrie Minerale, Bull. 4th ser. 4, p. 681-849, illus., 1905; 7, p. 433-488, St. Etienne, 1907. A review of the petroleum industry of the nation includes the Commonwealth. The geology of the Appalachian basin, with emphasis on oil-bearing rocks, is described.

VISHER, STEPHEN SARGENT

1. Memoir of Arthur Keith [1854-1944]: Assoc. Amer. Geog., Annals 34, p. 132-133, 1944.

VODGES, ANTHONY WAYNE

1. Notes on the distribution of iron ores in the United States . . .: 24 p., Fort Monroe, Va., 1886 [not seen].
2. A bibliography of Paleozoic Crustacea from 1698 to 1889 . . .: U. S. Geol. Survey, Bull. 63, 177 p., 1890. An annotated bibliography, mostly of trilobites, includes fossil locations and published articles about the Commonwealth. Genera and species are also listed.
3. A classed and annotated bibliography of the Paleozoic Crustacea, 1698-1892, to which is added a catalogue of North American species: Calif. Acad. Sci., Occasional Papers 4, 412 p., 1893; additions, Proc. 2nd ser. 5, p. 53-76, 1895; San Diego Soc. Nat. Hist., Trans. 3, 141 p., illus., 1917. The catalog is international but includes many references about the Commonwealth.

VOKES, HAROLD ERNEST

1. A large *Tentaculites* from the Shriver formation [Oriskany] of [Huntingdon County] Pennsylvania: Amer. Museum Novitates 984, 4 p., illus., 1938. *Tentaculites reedsi* is described and compared with other species.

VOLNEY, C. F.

1. Tableau du climat et du sol des États-Unis d'Amerique, 2 vols.: 532 p., maps, Paris, 1803; translated by C. B. Brown with title, A view of the soil and climate of the United States of America: 446 p., maps, Philadelphia, 1804. "Refers to the trend of the mountain ridges of the Appalachians and remarks "it is very remarkable that these ridges strike the course of the Atlantic rivers at right angles, the streams rushing through them at gaps or breaks, which have evidently been made by the force of their waters."—B. L. Miller.

VON BERNEWITZ, MAX WILHELM

1. The Pittsburgh district, Pa., *in* Mining districts of the Eastern States: Internatl. Geol. Cong., 16th, U. S. 1933, Guidebook 2, Excursion A-2, p. 7-19, illus., 1932. A generalized discussion of the mineral resources of the Pittsburgh area is given. No detailed geology is included.

VON ENGELN, OSCAR DEDRICH

1. Geomorphology: xxii, 665 p., illus., MacMillan, New York, 1942; discussion with title, Regional superposition on the Schooley peneplane, by A. N. Strahler: Amer. Jour. Sci. 242, p. 563-567, 1944. In a textbook, the peneplain concept is discussed and examples are taken from the Commonwealth. The theory of Cretaceous overlap, followed by consequent-stream development and uplift is propounded as the origin of the superimposed Appalachian rivers. Strahler opposes this theory on the basis of the distribution of windgaps, the form of ridge crests, and from the nature of the inner coastal plain margin.

VOORHEES, ANSON W. See Thiessen, Reinhardt, 1.

WADSWORTH, M. E. See Whitney, Josiah Dwight, 1.

WAGNER, NORMAN S.

1. Terreplein geology of Pocono Plateau: Pan-Amer. Geologist 63, p. 241-247, illus., 1935. Detailed mapping on the Plateau shows that revision of the geologic map is necessary. In many cases, the Mauch Chunk Formation has been confounded with the Catskill Formation, and the Pocono Formation is actually much less extensive than indicated.

WAHNSCHAFFE, FELIX

1. Mittheilungen über das Glacialgebeit Nordamerikas—die Endmoränen von Wisconsin and Pennsylvanien: Deutsche geol. Gesell., Zeitschr. 44, p. 107-122, illus., Berlin, 1892. This is a generalized discussion of the appearance and composition of the Wisconsin terminal moraine in the Commonwealth.

WALCOTT, CHARLES DOOLITTLE, 1850-1927.

1. The Utica shale and related formations of the same geological age: Albany Inst., Trans. 10, p. 1-17, 1883. The Utica shale in New York is described and correlated physically and paleontologically with shale units in nearby states. It is called the III, matinal [Martinsburg] shale in the Commonwealth.
2. The fauna of the lower Cambrian or Olenellus zone: U. S. Geol. Survey, Ann. Rpt. 10, Part 1, p. 509-760, illus., 1890; summary by J. F. James; Amer. Geologist 8, p. 82-86, 1891. The Lower Cambrian of North America is extensively described. The Commonwealth is included. It includes a bibliography. The fossils are listed and described.
3. Correlation papers—Cambrian: U. S. Geol. Survey, Bull. 81, 447 p., illus., 1891. A detailed description of Cambrian rocks in the United States includes the Commonwealth. An extensive bibliography is included. The rocks in southeastern Pennsylvania are described and correlated.
4. The North American continent during Cambrian time: U. S. Geol. Survey, Ann. Rpt. 12, Part 1, p. 523-568, illus., 1891. The paleogeography of the country is discussed from an analyses of Cambrian sedimentation. The Commonwealth is included.
5. Notes on the Cambrian rocks of [southeastern] Pennsylvania and Maryland, from the Susquehanna to the Potomac: Amer. Jour. Sci. 3rd ser. 44, p. 469-482, 1892. The Cambrian rocks in Lancaster, York, Adams, and Franklin Counties are described and their stratigraphic sequence is worked out. Sections are measured; fossils are listed.
6. Notes on the Cambrian rocks of [southeastern] Pennsylvania from the Susquehanna to the Delaware: Amer. Jour. Sci. 3rd, ser. 47, p. 37-41, 1894. All of the limestones in the Lancaster and Chester Valleys are called Cambrian on the basis of fossil fragments. The Ordovician System may be present but proof is lacking.
7. Paleozoic intra-formational conglomerates [York-Lancaster Counties]: Geol. Soc. Amer., Bull. 5, p. 191-198, illus., 1894. Conglomerates composed of the material above and below them are described from Bellemont and Stoners Station. The origin is from slight uplift of previously solidified sediments which are then weathered and redeposited. It is called Cambrian, but it probably is Ordovician in age.
8. The Cambrian rocks of [southeastern] Pennsylvania: U. S. Geol. Survey, Bull. 134, 43 p., illus. incl. geol. map, 1896. The Cambrian System is recognized and described from many localities. Sections are measured; fossils are listed. A good review of previous work is given. The [Conestoga limestone and conglomerate] are included in the Cambrian. It is hard to distinguish Cambrian from Ordovician limestones. The intraformational conglomerates which are discussed are [Ordovician].
9. Cambrian Brachiopoda: U. S. Geol. Survey, Mon. 51, (2 vols.), 872, 363 p., illus., 1912. Several species of Lower Cambrian inarticulates are described and illustrated from York, Lancaster, Franklin, and Cumberland Counties.
10. John Mason Clarke [1857-1925]: Science ns 62, p. 558, 1925.

WALDO, ALLEN WORCESTER

1. Petrology of the Bradford sand of the Kane district [McKean County]: Pa. State College Mineral Industry Experiment Sta., Bull. 24, 31 p., illus., 1938. Petrologic studies, mechanical, mineralogical, and chemical, are made of the Bradford sand. The origin of the sandstone is considered.

WALKER, FRANCIS A.

1. Memoir of William Barton Rogers, 1804-1882: Natl. Acad. Sci., Biog. Mem. 3. p. 3-13, 1895.

WALL, J. SUTTON

1. Report on the coal mines of the Monongahela River region from the West Virginia state line to Pittsburgh, including the mines on the lower Youghiogheny River: Pa. Geol. Survey 2nd, K 4, xxxviii, 231 p., illus., 1884. While the report deals mostly with the operation and economics of individual mines, it does give measured sections in the coal and a historical account of the development of the area.

WALLACE, DOROTHY M.

1. Piedmont terraces in Pennsylvania and Maryland. M.A. thesis, Columbia Univ., 1935.

WALTER, EMMA

1. Does the Delaware Water Gap [Northampton-Monroe Counties] consist of two river gorges?: Acad. Natl. Sci. Phila., Proc. [47] 1895, p. 198-205, illus., 1895. A detailed study of the physiography suggests that the pre-glacial Delaware River flowed northward, eroded southward and headward, and formed a plunge pool at the ridge. During and after glacial times, the river flowed southward, eroded headward (northward) and formed a plunge pool. The gap is a modified hour-glass shape of the coalescence of the two plunge pools.

WALTERS, RAYMOND

1. Nevin M[elancthon] Fenneman [1865-1945]: Science 102, p. 142-143, 1945.

WANLESS, HAROLD ROLLIN

1. Pennsylvanian correlation in the Eastern Interior and Appalachian coal fields: Geol. Soc. Amer., Special Paper 17, vii, 130 p., illus., 1939. This is a complete, detailed description and discussion of Pennsylvanian rocks of the Commonwealth. The correlation is based on paleobotany and cyclical evidence from thin but persistent units.
2. Regional variation in Pennsylvanian lithology: Jour. Geology 55, p. 237-253, illus., 1947. A discussion of the various cyclical features of the Pennsylvanian from all over North America includes the Commonwealth. The Appalachian Pennsylvanian System is characterized by a predominance of clastic rocks, largely non-marine, by an abundance of coal beds, and locally, by fire clay, flint, sedimentary iron ore, red beds, and fresh-water limestones.
3. Pennsylvanian isopach studies in the eastern and central United States [abs.]: Geol. Soc. Amer., Bull. 59, p. 1360-1361, 1948.

WANNER, ATREUS

1. The discovery of fossil tracks, algae, etc. in the Triassic of York Co., Pa.: Pa. Geol. Survey 2nd, Ann. Rpt. 1887, p. 21-35, illus., 1889. A quarry near Goldsboro has yielded dinosaur footprints, algae and some uncertain forms. The algae are new; the rest are unnamed.
2. Casts of *Scolithus* flattened by pressure [York County]: Amer. Geologist 5, p. 35-38, illus., 1890. The cylindrical casts of these worm tubes are flattened at right angles to the source of pressure, without exception. They are in the Hellam conglomerate [Chickies quartzite].
3. (and Fontaine, William Morris). Triassic flora of York County, Pennsylvania: U. S. Geol. Survey, Ann. Rpt. 20, Part 2, p. 233-255, illus., 1900. Twenty-four genera and twenty-eight species of plants are described and illustrated from the Triassic near York Haven.
4. A new species of *Olenellus* from the Lower Cambrian of York County, Pennsylvania: Wash. Acad. Sci., Proc. 3, p. 267-272, illus., 1901. *Olenellus (Holmia) walcottensis* is described from the [Kinzers] Formation near York.

WANNER, HENRY E.

1. Some faunal remains from the Triassic of York County, Pennsylvania: Acad. Nat. Sci. Phila., Proc. 73, 1921, p. 25-37, illus., 1921. A brief description of the Triassic rocks is followed by descriptions and illustrations of crustaceans, fish, reptiles, tracks, snails, clams, and worms.
2. (and Pilsbry, H. A.). Some additional faunal remains from the Trias of York County, Pennsylvania: Acad. Nat. Sci. Phila., Proc. 78, 1926, p. 21-28, illus., 1927. Reptile fragments, *Estheria mangaliensis pennsylvanicus, Naiadites*

triassicus and *N. wanneri* are described and illustrated. The entire known Triassic fauna of the County is listed.

WARD, FREEMAN

1. Sand and gravel in the Altoona region, Pa.: Pa. Topog. Geol. Survey [4th ser.], Bull. 100, 15 p. (#), illus., 1927. Crushed rock is the chief sand-source of the area. The river valleys may contain sufficient alluvial sand, but the size and character of these deposits is unknown.
2. Sand and gravel in the Scranton region: Pa. Topog. Geol. Survey [4th ser.], Bull. 96, 15 p. (#), illus., 1928. In the Lackawanna Valley, gravels contain coal fragments and are very coarse-grained; washing water is plentiful. The deposits in the Susquehanna Valley contain no coal and the deposits are large Other outlying areas are described. General conditions of formation are discussed, but no specific details in any area are given.
3. A Wisconsin ice tongue in the Delaware Valley [Northampton County]: Amer. Jour. Sci. 5th ser. 18, p. 446-448, 1929; discussion with title, Probable Illinoian till beneath Wisconsin gravel in the Delaware Valley, by F. Leverett, 19, p. 71, 1930. Till lies below known Wisconsin gravels. The amount of weathering in it is the same as the Wisconsin gravels. Residual clay from the underlying limestone is present below the till, suggesting that the till-transporting ice was thin. The age of the glaciated valley suggests that the till is relatively young and probably Wisconsin in age. Leverett says the till is Illinoian.
4. Sand and gravel in the Reading region, Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 99, 13 p. (#), illus., 1929. Most of the sand comes from local quarries as crushed schist or quartzite. Various river valleys are discussed, but no details are given. Much of the river sand contains coal.
5. The rôle of solution in [eastern Pa.] peneplanation: Jour. Geology 38, p. 262-270, illus., 1930. The Somerville surface is not the result of a cycle of erosion following uplift, but rather the result of solution. Its limitation to areas of limestone, lack of stream incision, presence of shale monadnocks, absence of stream abrasion tools, and several other features indicate that it is not due to stream erosion.
6. Distribution of the Wisconsin glacier in the Delaware Valley [Northampton County]: Geol. Soc. Amer., Bull. 45, p. 655-664, illus., 1934. The main Wisconsin ice sheet did not cross Kitattinny Mountain. Two ice stages probably occurred because of the two directions of striae and different depth of weathering. Illinoian ice overrode the mountain, but Wisconsin ice moved southwestward on both sides of the mountain, the southern lobe being a tongue in the Delaware Valley. The terminal moraine does not cross the mountain in the county, and Illinoian drift is on top.
7. Recent geological history of the Delaware Valley below the water gap [Northampton County]: Pa. Geol. Survey 4th ser., G-10. v, 76 p., illus., 1938. Emphasis is laid on the glacial features. Illinoian and Wisconsin features, mostly terraces, kames, and till of all sorts are evident. Weathering, deposition and erosion are all interrelated.

WARD, H. A. See Owens, William G., 1.

WARD, LESTER FRANK, 1841-1913.

1. The geographical distribution of fossil plants: U. S. Geol. Survey, Ann. Rpt. 8, Part 2, p. 669-960, illus., 1889. A bibliographic synopsis of world-wide plant distribution, including the Commonwealth is given. In Pennsylvania, plants are known from Middle Devonian to Permian. Not all are listed, but just the important first contributions.
2. The plant-bearing deposits of the American Trias: Geol. Soc. Amer., Bull. 3, p. 23-31, 1892. The Triassic rocks of the Commonwealth contains eighteen different plants. Five are confined to the Pennsylvania basin, whereas thirteen are also present in other basins. This answers the question about the contemporaneity of all the Triassic in eastern North America. When compared to foreign Triassic deposits florally, these are Upper Triassic.
3. Status of Mesozoic floras of United States—first paper, the older Mesozoic: U. S. Geol. Survey, Ann. Rpt. 20, Part 2, p. 217-748, illus., 1900. A description of fossil plants from the Triassic of the Commonwealth is included. (See Wanner and Fontaine, 1900).

WARD, ROBERT DEC.

1. Another river pirate [Bucks County]: Science 19, p. 7-9, 1892. Tinicum Creek is shown to have pirated a tributary of Tohickon Creek. The relation of the piracy to the flood plain of the Delaware River is discussed.

WARMKASSEL, CARL A. See Miller, Benjamin LeRoy, 30.

WARREN, CHARLES HYDE

1. George Jarvis Brush (1831-1912): Amer. Acad. Arts and Sci., Proc. 51, p. 853-857, 1916.

WARREN, J. C. See Rogers, Henry Darwin, 19.

WASHBURNE, CHESTER WESLEY

1. Frederick Gardner Clapp (1879-1944): Amer. Assoc. Petroleum Geologists, Bull. 29, p. 402-409, port., 1945; Geol. Soc. Amer., Proc. 1944, p. 163-169, port., 1945.

WASMUTH, HENRY A.

1. Studies on the stratification of the anthracite measures of Pennsylvania: Franklin Inst., Jour. 124, p. 109-126, illus., 1887. Faulting in the basins is described. Folds pass axially into faults. The effects on specific beds in specific mines are cited. No overturned beds are noted.
2. Notes on the Pittsburgh coal bed [Westmoreland County] and its disturbances: Amer. Geologist 1, p. 272-277, illus., 1888. Small structural features are described in association with the major structures, which are folds. Breaks, joints, cleavage, and "veins" of all sorts are described and illustrated. The coal must have been solid and brittle when the deformation occurred.
3. Notes on the structural geology of the Carboniferous formation of Pennsylvania: Amer. Geologist 2, p. 311-323, illus., 1888. Folding is a result of collapse of the surface rocks into subterranean voids created by magmatic evacuation. The rocks were brittle, and so fractured when subjected to the tension and compression. Major structural distortion is also present.
4. The southern anthracite coal field of Pennsylvania—its enormous disturbances and consequent premature exhaustion: Franklin Inst., Jour. 125, p. 110-114, 1888. A cursory description of the folded and faulted basin is given. Certain faults are described in detail. The faults have reduced the volume of coal in the basin to much less than otherwise suspected. [Overturned beds] are not present.
5. Studies on the stratification of the northern anthracite field of [Luzerne County] Pennsylvania: Franklin Inst., Jour. 134, p. 354-358, illus., 1892. Ancient Susquehanna River channeled deep, and the filled channel may intersect certain coal seams. Should the coal be mined to that point, a mine flood would result and the river would be diverted. Mineable pillars are left below the channel as a safeguard.

WATERSCHOOT VAN DER GRACHT, WILLEM ANTON JOSEPH MARIA VAN. See also Jongmans, Willem Josephus, 2, 5.

1. De Laat-Palaeozoische plooüngsphase in Noord Amerika. K. Nederlandsch. Aardrijksk. Genootschop Amsterdam, Tydschr. 2nd ser. 50, p. 903-929, 1933; also [in Russian] Internatl. Geol. Cong., 17th, Moscow 1937, Rpt. 2, p. 361-376, illus., Moscow, 1939. A review of the location, extent, and comparative strength of the Devonian-Permian orogenies in the United States includes the Commonwealth. Maps show locations. They are compared with those in Europe.

WATSON, EDWARD HAHN See also Gordon, Samuel George, 13.

1. (and others). Crystalline rocks of the piedmont, north and west of Philadelphia, trip C *of* Geology of the Philadelphia area, by E. Watson: Field Conf. of Pa. Geologists, 5th, p. 19-34 (#), illus. [n.p.] [1935]. This is a somewhat detailed mimeographed road itinerary. Each area is described. Precambrian rocks only are described.
2. (and others). [Geology of] Philadelphia area of southeastern Pennsylvania: Field Conf. of Pa. Geologists, 5th, 43 p. (#), illus. [n.p.] [1935]. A mimeographed discussion of the geology of southeastern Pennsylvania is given. Precambrian-Ordovician, and Triassic rocks are discussed. Contains individual trips by L. Dryden, S. Gordon, E. Watson, and B. L. Miller which are cited individually.

3. Alteration of gabbro near Philadelphia [Delaware-Philadelphia Counties], Pennsylvania [abs.]: Amer. Mineralogist 21, p. 200-201, 1936.
4. Emplacement of granite at Springfield [Delaware County] near Philadelphia [abs.]: Geol. Soc. Amer., Proc. 1935, p. 117, 1936.

WATSON, THOMAS LEONARD

1. West Elizabeth [Allegheny County], Pennsylvania, deep well: Science ns 34, p. 125-126, 1911. A well over 5000 feet deep, drilled in 1897 is logged for lithology and temperature. The geology is only sketchily mentioned, but the temperature gradient is discussed in detail. It is 127° F. at the bottom, with the increase not being constant. Explanations are offered.
2. (and Grasty, John Sharshall). Barite of the Appalachian states: Amer. Inst. Mining Engineers, Bull. 98, p. 345-390, illus., 1915; Trans. 51, p. 514-559, illus., 1916. An extremely brief resumé of occurrences of barite in the Commonwealth is given. No details are included.
3. Weathering of allanite: Geol. Soc. Amer., Bull. 28, p. 463-500, illus., 1917. Allanite, weathering to peculiar products, is reported from many localities, including southeastern Pennsylvania. Analyses are given.

WATTS, A. S.

1. The feldspar of New England and north Appalachian States: U. S. Bur. Mines, Bull. 92, 181 p., illus., 1916. The feldspar deposits in Delaware and Chester Counties are described in detail. Individual deposits are discussed. Some analyses are made.

WEAGLE, LAWRENCE T.

1. Geology of the Darby Creek valley [Delaware County] adjacent to Bryn Mawr, Pennsylvania: M.S. thesis, Bryn Mawr College, 1941.

WEAVER, THOMAS

1. On the Carboniferous series of the United States of North America: Phil. Mag. 3rd ser. 9, p. 124-132, London, 1836; discussion by R. C. Taylor, p. 407-411; reply by author, 10, p. 365-368. The intercalated coal, sandstones, and limestones are briefly described, as are their relations to the underlying [systems]. They are [Upper Paleozoic]. Taylor considers them [Mesozoic].

WEBBERT, C. W.

1. River and creek coal in eastern Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 6, 10 p. (#), 1920; 2nd ed., 1922. The source of coal in the rivers and creeks is considered and described. Production is outlined.

WEED, WALTER HARVEY

1. Copper deposits of the Appalachian states: U. S. Geol. Survey, Bull. 455, 166 p., illus., 1911. The South Mountain copper region, northern coal region [Bradford County], and the east central copper region are briefly described. No commercial copper comes from the Commonwealth at this time [1911].

WEINSCHENK, E.

1. Weitere Beiträge zur Kenntniss der Minerallagerstätten der Serpentin in den östlichen Centralalpen: Zeitschrift fur Krystallographie 27, p. 559-573, Leipzig, 1897. Included is a description of lancasterite from Texas, Lancaster County.

WEISS, JUDITH

1. Contact metamorphism in Van Artsdalen's quarry near Feasterville [Bucks County], Pennsylvania: M.A. thesis, Bryn Mawr College, 1945.
2. Origin of a scapolite metagabbro in Bucks County, Pennsylvania: Geol. Soc. Amer., Bull. 58, p. 821-832, illus., 1947. Gabbro invaded Precambrian limestone and was later metamorphosed to metagabbro. Dynamic action contorted the whole and the metagabbro is now in boudins. Several stages of deformation are postulated; the crystallization sequence is described.
3. Wissahickon schist at Philadelphia [Philadelphia-Bucks Counties], Pennsylvania: Ph.D. thesis, Bryn Mawr College, 1948; Geol. Soc. Amer., Bull. 60, p. 1689-1726, illus. incl. geol. maps, 1949. The Wissahickon schist was originally a sandy, shaly, arkosic sedimentary rock which has been intensely metamorphosed and altered to schist. Metamorphic zones are outlined. Granitization is also evident. The structure is an abnormal synclinorium. Faulting is also present.

WEITZ, JOHN HILLS

1. High-grade dolomite deposits in the United States: U. S. Bur. Mines, Info. Circ. 7226, 86 p. (#), 1942. A brief discussion of the Commonwealth is included.

Those of Cambrian and Ordovician age, in the southeastern counties, are the most common. Analyses are made.

WELLER, JAMES MARVIN. See also Levorsen, Arville Irving, 1.

1. (chairman). Correlation of the Mississippian formations of North America [chart no. 5]: Geol. Soc. Amer., Bull. 59, p. 91-106, illus., 1948. A time-rock chart shows the correlations of the Mississippian rocks of the Commonwealth with those of the rest of North America.

WELLER, STUART

1. A bibliographic index of North American Carboniferous invertebrates: U. S. Geol. Survey, Bull. 153, 653 p., 1898. A list of genera and species occurring in the Pennsylvanian System includes the Commonwealth.
2. Classification of the Mississippian series: Jour. Geology 6, p. 303-314, illus., 1898. A description of the Mississippian time-rock units and their distribution includes the Commonwealth. Paleogeographic distribution is included. It is very general with no details.
3. The composition, origin, and relationships of the Corniferous fauna in the Appalachian province of North America: Jour. Geology 10, p. 423-432, 1902. The various faunas of the Devonian formations seem to be different from one another, with little or nothing in common. They were probably derived by migrations from other areas. The Hamilton fauna most resembles the [Onondaga] fauna. The Onondaga fauna itself seems to be limited to the Appalachian area. Faunal lists are given and compared with other faunal lists of other places.
4. Correlation of the middle and upper Devonian and the Mississippian faunas of North America: Jour. Geology 17, p. 257-285, 1909. The Commonwealth is included in the eastern continental province. The various major time-rock units and their faunas are described and correlated. No detailed lists are included, however.

WELLS, DANA. See Price, Paul Holland, 3.

WELLS, HENRY

1. (and others). [Resources of Bradford County] [abs.]: Monthly Amer. Jour. Geology 1, p. 519-520, 1832.

WELLS, HORACE LEMUEL

1. Samuel Lewis Penfield [1856-1906]: Science ns 24, p. 252-253, 1906.
2. Biographical memoir of Samuel Lewis Penfield, 1856-1906: Natl. Acad. Sci., Biog. Mem. 6, p. 119-146, port., 1907.

WELLS, ROGER CLARK

1. (and Fairchild, John Gifford, and Ross, Clarence Samuel). Thorianite from Easton [Northampton County], Pa.: Amer. Jour. Sci. 5th ser. 26, p. 45-54, 1933. Thorianite occurs with serpentine. It is in a highly altered, contact-metamorphosed limestone. Twenty-seven associated minerals are also listed. The thorianite is described in detail and is age-dated to the Precambrian.

WESTGATE, LEWIS G.

1. Memorial of Eugene Wesley Shaw [1881-1935]: Geol. Soc. Amer., Proc. 1935, p. 311-318, port., 1936.

WESTOLL, THOMAS STANLEY

1. The Haplolepidae, a new family of Late Carboniferous bony fishes, a study in taxonomy and evolution: Amer. Museum Nat. Hist., Bull. 83, p. 3-121, illus., 1945. A monographic study includes a description of *Haplolepis* aff. *ovoidea* from the Pennsylvanian shale near Cannelton, Beaver County.

WETHERED, EDWARD

1. On the structure and formation of certain English and American coals: Cotteswold Naturalists' Field Club, Proc. 8, p. 281-298, 1885.

WETHERILL, CHARLES MAYER, 1825-1871.

1. Chemical examination of two minerals from the neighborhood of Reading [Berks County], Pa.—and on the occurrence of gold in [Montgomery County] Pennsylvania: Amer. Phil. Soc., Trans. ns 10, p. 345-351, 1853. Molybdenite and zircon are described from some indeterminate places in the county. Gold is reported in the sand and gravel of a well being dug in Franconia Township.
2. Examination of molybdate of lead, from Wheatley's mine near Phoenixville, Chester Co., Pa.: Acad. Nat. Sci. Phila., Proc. [1852, 1853] 6, p. 55, 119, 1854. [Wulfenite] is described and analyzed.

WHALEY, JAMES HIGGINS

1. The Cambrian age: B.S. thesis, Cornell Univ., 1885.

WHEATLEY, CHARLES M. See also Genth, Frederick Augustus, 12.

1. Remarks on the Mesozoic red sandstone of the Atlantic slope and notice of the discovery of a bone bed therein at Phoenixville [Chester County], Pa.: Amer. Jour. Sci. 2nd ser. 32, p. 41-48, 1861. The Mesozoic sandstone is considered to be Triassic or Jurassic or possibly both by virtue of the reptile remains. The fauna and flora of a fossil bed in the Lockatong Formation are listed. A section is measured.
2. Notice of the discovery of a cave in [Montgomery County] eastern Pennsylvania containing remains of post-Pliocene fossils: Amer. Jour. Sci. 3rd ser. 1, p. 235-237, 384, illus., 1871. A cave in the Ordovician limestone at Port Kennedy on the Schuylkill River has revealed bones of mammals, reptiles, amphibians, birds, insects, and plants; forty-seven species in all are present.

WHERRY, EDGAR THEODORE. See also Barrell, Joseph, 4; Bascom, Florence, 17; Benge, Elmer, 2; Miller, Benjamin LeRoy, 6; Shannon, Earl Victor, 1; Stose, George Willis, 20.

1. A new occurrence of scapolite [Philadelphia County]: Mineral Collector 14, p. 37-39, 1907. An area near Frankford has yielded a scapolite called wernerite. It is in the veins of pegmatite in a hornblende granite. This is its first reported occurrence from pegmatite.
2. Radium in Pennsylvania: Mineral Collector 14, p. 17-20, illus., 1907; correction, p. 43. A mention is made of various radioactive minerals known from the Commonwealth. None are economically significant. Radium is associated with uranium minerals, which are listed by location and by uranium content.
3. Radioactive minerals found in Pennsylvania and their effect on the photographic plate: Franklin Inst., Jour. 165, p. 59-78, 1908. A list of eighteen minerals and their locations is included. Most are from the southeastern counties.
4. The Newark copper deposits of southeastern Pennsylvania: Economic Geology 3, p. 726-738, illus., 1908. Copper ore is associated with igneous rocks in the diabase, in the metamorphosed sedimentary rocks, and in fault fissues intersecting the diabase. It occurs apart from the diabase from a deep-seated origin, and from a sedimentary origin. Those ores with the diabase are most common. Examples of each kind are given.
5. The early Paleozoic of the Lehigh Valley district, Pennsylvania [abs.]: Science ns 30, p. 416, 1909.
6. Contributions to the mineralogy of the Newark group in [Montgomery County] Pennsylvania: Wagner Free Inst. Science, Trans. 7, p. 5-27, illus., 1910. Triassic diabase dikes are described geologically and petrographically. The Triassic sedimentary rocks also are discussed. Some of the diabase is considered extrusive because it is conformable to the sedimentary rocks. The sedimentary rocks are metamorphosed, and analyses are given. Datolite and zeolites in the diabase were formed during cooling and not by subsequent weathering.
7. The copper deposits of Frankin-Adams Counties, Pa.: Franklin Inst., Jour. 171, p. 151-163, illus. incl. geol. map, 1911. Native copper in stringers, chalcocite grains, and malachite stains are found in greenstone (metamorphosed basic lava) of Precambrian age. The native copper was carried as a dilute solution, and not as a sulphate.
8. A new occurrence of carnotite [Carbon County]: Amer. Jour. Sci. 4th ser. 33, p. 574-580, 1912. Carnotite from the Mauch Chunk Formation is described and analyzed. It occurs in scattered streaks and patches throughout a conglomeratic zone. It is from adjacent black shales but has been redeposited in the conglomerate by ground water; it was originally a clastic sediment in the black shale.
9. Age and correlation of the "New Red" or Newark group in Pennsylvania: Acad. Nat. Sci. Phila., Proc. 64, p. 373-379, illus., 1912. A review of previous evidence, mostly plants and invertebrates, demonstrates a Middle Triassic age for the rocks and not Permian or Jurassic as previously speculated.
10. Apparent sun-crack structures and ringing rock phenomena in the Triassic diabase of eastern Pennsylvania: Acad. Nat. Sci. Phila., Proc. 64, p. 169-172, 1912; discussion by G. W. Stose [abs.]: Geol. Soc. Amer., Bull. 22, p. 718, 1911.

Hexagonal jointing in basalt as a result of contraction while cooling is described and explained. The ringing rocks are boulder fields composed of unusually hard rock whose texture gives them the ringing quality.

11. Silicified wood from the Triassic of [southeastern] Pennsylvania: Acad. Nat. Sci. Phila., Proc. 64, p. 366-372, illus., 1912. *Araucarioxylon virginianum, A. vanartsdaleni* and *Brachyoxylon pennsylvanianum* are described from the basal part of the Triassic in many places.
12. The Triassic of Pennsylvania [abs.]: Acad. Nat. Sci. Phila., Proc. 64, p. 156, 1912.
13. North border relations of the Triassic in Pennsylvania: Acad. Nat. Sci. Phila., Proc. 65, p. 114-125, illus., 1913. A study of the conglomerates suggests extensive overlap northward rather than faulting. Ice-rafted boulders are in the conglomerate also.
14. Carnotite near Mauch Chunk [Carbon County], Pa.: U. S. Geol. Survey, Bull. 580-H, p. 147-151, 1914. The mineral occurs in a layer 40 feet thick of coarse-grained conglomerate near the base of the Pottsville Formation, and just above the Mauch Chunk Formation. It is a precipitate from ground water. It is very limited.
15. Notes on . . . beraunite [Northampton County], and axinite [Delaware County]: U. S. Natl. Museum, Proc. 47, p. 501-511, 1914. Beraunite from an iron ore pit in Hellertown, Northampton County, and axinite from Avondale, Delaware County, are described and analyzed.
16. A peculiar oolite from Bethlehem [Northampton County], Pennsylvania: U. S. Natl. Museum, Proc. 49, p. 153-156, illus., 1915. Oolites which are partly white and partly gray are described. The original oolites were aragonite with impurities. Ground water dissolved the aragonite and the concentrated impurities settled to the bottom of the cavity. Later ground-water precipitation filled in the cavity and the half-and-half arrangement resulted.
17. Notes on . . . fuchsite [Chester County] . . . : U. S. Natl. Museum, Proc. 49, p. 463-467, 1915. Fuchsite occurs in a fine-grained dolomite with abundant granular quartz near Harmony Hill.
18. Glauberite crystal-cavities in the Triassic rocks of eastern Pennsylvania: Amer. Mineralogist 1, p. 37-43, illus., 1916. Cubic cavities in shale are attributed to dissolved glauberite. Some are filled with calcite pseudomorphs. The crystals of glauberite must have precipitated in the Triassic lake-muds before the compaction to shale occurred.
19. Notes on the geology near Reading [Berks County], Pennsylvania [abs.]: Wash. Acad. Sci., Jour. 6, p. 23, 1916; discussion by G. W. Stose, p. 23.
20. Two new fossil plants from the Triassic of [Bucks County] Pennsylvania: U. S. Natl. Museum, Proc. 51, p. 327-329, illus., 1916. *Palissya longifolia* and *Brunswickia dubia,* both new, are described from the Lockatong and Brunswick Formations, respectively.
21. Notes on mimetite, thaumasite, and wavellite [Northampton County]: U. S. Natl. Museum, Proc. 54, p. 373-381, illus., 1918. The crystallography and chemistry of acicular wavellite from Hellertown are described.
22. Precambrian sedimentary rocks in the Highlands of eastern Pennsylvania: Geol. Soc. Amer., Bull. 29, p. 375-392, illus., 1918. Limestone, quartz-mica schist, graphite-bearing quartzite, and basic (amphibolite) gneiss are all considered as sedimentary in origin with metamorphic and magmatic modifications. Some are migmatitic.
23. Some minerals from Sylmar [Chester County], Pennsylvania: Amer. Mineralogist 3, p. 47, 1918. Zoisite, apatite, and serpentine occur as small specks on albite crystals where otherwise only feldspar and quartz are common.
24. The life and work of Amos Peaslee Brown [1864-1917]: Amer. Mineralogist 3, p. 21-23, 1918.
25. Monazite from Boothwyn [Delaware County], Pennsylvania: Amer. Mineralogist 4, p. 123-124, illus., 1919. Crystals of monazite from a quarry near Boothwyn are described. No analyses or geologic data are included.
26. Illustration of the isometric system—pyrite from Falls of French Creek [Chester County], Pennsylvania: Amer. Mineralogist 5, p. 116-117, 1920. Pyrite with cubes, diploids, and other modifying forms mixed with magnetite are described. Simple octahedra generally occur under most other circumstances.

27. (and Shannon, Earl Victor). Crocidolite from [south-] eastern Pennsylvania: Wash. Acad. Sci., Jour. 12, p. 242-244, 1922. Glaucamphiboles from many localities are discussed. One from Oley Line, Berks County, is described in detail, and is crocidolite. It was deposited secondarily from hydrothermal solutions from Precambrian and Triassic magmas.
28. The Blue Rocks in Greenwich Township [Berks County]: Berks Co. Hist. Soc., Trans. 3, p. 204-208, 1923. A boulder field is described. The boulders are attributed to spheroidal weathering in a stream valley in which the spalled fragments are washed away by the stream.
29. A conifer from the Triassic of Bucks County, Pa.: Pa. Acad. Sci., Proc. 7, p. 164, 1933. An impression of a fossil plant resembling *Strobilites laxus* is reported from the Brunswick shale near Sellersville. No description is given.
30. Triassic system, *in* Lehigh County, Pennsylvania, by B. L. Miller: Pa. Geol. Survey 4th ser., C-39, p. 231-236, 1941. The Newark group crops out in a band two miles wide. The Brunswick, Lockatong, and Stockton Formations are present. The rocks are described and correlated.

WHITCOMB, LAWRENCE. See also Cooper, Gustav Arthur, 2; Miller, Benjamin LeRoy, 25; Willard, Bradford, 43.

1. New information on *Homalonotus trentonensis* [Clinton County]: Geol. Soc. Amer., Bull. 41, p. 341-350, illus., 1930. Fragments are obtained from the type locality, in the Salona limestone, which permit a more accurate description than the holotype.
2. Correlation by Ordovician bentonite [Central Pa.]: Jour. Geology 40, p. 522-534, illus., 1932. The general technique of bentonite use in correlation is discussed, with examples being taken from central Pennsylvania. The Salona limestone has five bentonite layers near its base, and these have been traced for 75 miles along the strike and for over 20 miles across the strike.
3. Correlation of Ordovician limestone at Salona, Clinton County, Pennsylvania: Pa. Geol. Survey 4th ser., G-5, 16 p., illus., 1932. The Trenton group is divided into the Salona and Coburn limestones, and correlations are made to other parts of the Commonwealth and Europe. Fossils and bentonite are discussed.
4. (and Engel, J. A.). The probable Triassic age of the Spitzenberg conglomerate, Berks County, Pa.: Pa. Acad. Sci, Proc. 8, p. 37-43, 1934. An outlier contains fragments of material which are not locally derived. The sedimentary conditions are unlike those of the apparently related Martinsburg Formation. The age is postulated as Triassic; overlap on the Martinsburg Formation occurred.
5. (and Rosenkrans, Robert Russell). Bentonite beds in the lower Chambersburg [Franklin County]: Geol. Soc. Amer., Bull. 46, p. 1251-1254, illus., 1935. Four bentonite beds can be traced for over 30 miles along the strike. All of the beds are not found in any of the nine sections studied, but characteristic physical properties permit stratigraphic recognition.
6. J. Peter Lesley [1819-1903], geologist—what was his correct name?: Pa. Acad. Sci., Proc. 14, p. 31-34, 1940. This is a biographical discussion of the chief geologist of the Second Survey who used several different signatures on his publications.
7. Bentonite and unconformities [abs.]: Geol. Soc. Amer., Bull. 52, p. 1939, 1941.
8. Spitzenberg conglomerate as a Triassic outlier in [Berks County] Pennsylvania: Geol. Soc. Amer., Bull. 53, p. 755-764, illus., 1942. A synclinal outlier on highly contorted Ordovician shale is considered to be Triassic in age. Arkose, shale and conglomerate are present. Lithologically they resemble the nearby Triassic rocks. No fossils are found. Provenance was to the north.
9. An unusual Hardyston-Tomstown contact at Hellertown [Lehigh County], Pennsylvania: Pa. Acad. Sci., Proc. 22, p. 112-116, illus., 1948. The contact was exposed and described. The Tomstown dolomite is not present, but residual clay rests sharply on a pitted and pock-marked upper Hardyston sandstone surface. The contact is assumed conformable as no intervening shale beds are present.

WHITE, CHARLES ABIATHER, 1826-1910.

1. Correlation papers—Cretaceous: U. S. Geol. Survey, Bull. 82, 273 p., illus., 1891. This is a detailed discussion of the Cretaceous System of the United States. Only gravels and clay of the non-marine westward extension of the

New Jersey Cretaceous rocks occur in patches on the western side of the Delaware River. No details are given.

2. Bibliographical memoir of John Strong Newberry, 1822-1892: Natl. Acad. Sci., Biog. Mem. 6, p. 1-24, port., 1906.

WHITE, CHARLES DAVID, 1862-1935. See also Ashley, George Hall, 28; Barrell, Joseph, 4; Chadwick, George Halcott, 5.

1. The thickness and equivalence of some basal coal measure sections along the eastern margin of the Appalachian basin [abs.]: Science ns 3, p. 534-535, 1896; Amer. Geologist 17, p. 266, 1896.
2. Relative ages of the Kanawha and [western Pa.] Allegheny series as indicated by the fossil plants: Geol. Soc. Amer., Bull. 11, p. 145-178, 1900; discussion with title, [Catskill sedimentation] by H. S. Williams, p. 594-595. The flora of the Allegheny Formation is described and compared to the flora of the upper part of the stratigraphically lower Kanawha Formation farther to the south. The problem of facies and environmental shifting is described. Williams points out the differing age of the Catskill Formation at different places in the Commonwealth also.
3. The stratigraphic succession of the fossil floras of the Pottsville formation in the southern anthracite coal field [Schuylkill, Dauphin, and Carbon Counties], Pennsylvania: U. S. Geol. Survey, Ann. Rpt. 20, Part 2, p. 749-930, illus., 1900. The plants at the Pottsville Formation type section are described and illustrated. The stratigraphic succession is considered in detail, and the paleobotanic limits of the formation are outlined. The flora is divided into the Upper and Lower Lykens, Pottsville, Sharp Mountain and Broad Mountain divisions, or zones.
4. Age of the coals at Tipton, Blair Co., Pa.: Geol. Soc. Amer., Bull. 12, p. 473-477, 1901. Paleobotanical studies show the coal to be Pennsylvanian rather than Mississippian in age. The coal has been faulted down to juxtaposition with the Pocono Formation across the valley, hence the confusion. The fault is described.
5. (and Campbell, Marius Robinson). The bituminous coal field of Pennsylvania, *in* The northern Appalachian coal field: U. S. Geol. Survey, Ann. Rpt. 22, Part 3, p. 127-200, illus., 1902. Detailed Pennsylvanian and Permian stratigraphy is discussed, with the included coals. Analyses are made.
6. Age of the Mercer group [abs.]: Science ns 17, p. 942, 1903.
7. Memoir of Ralph Dupuy Lacoe [1824-1901]; Geol. Soc. Amer., Bull. 13, p. 509-515, 1903.
8. Deposition of the Appalachian Pottsville: Geol. Soc. Amer., Bull. 15, p. 267-282, illus., 1904. The Appalachian basin, including the Commonwealth, is described physically and the various Lower Pennsylvanian units in it are described and correlated. Various transgressions and regressions are discussed.
9. Permian elements in the Dunkard flora [abs.]: Geol. Soc. Amer., Bull. 14, p. 538-542, 1904. This is a detailed abstract. The Appalachian trough, which includes southwestern Pennsylvanian, is considered. Floras and their characteristic world-wide stratigraphic position are listed. The final analysis is that the Dunkard group is Permian rather than Pennsylvanian as thought by some.
10. The upper Paleozoic floras, their succession and range: Jour. Geology 17, p. 320-341, illus., 1909. A general discussion of the flora of the world includes the Commonwealth. Comparisons are made, and the question of climate is discussed.
11. Upper Paleozoic climate as indicated by fossil plants: Scientific Monthly 20, p. 465-473, 1925. A popular account of the early climates has examples taken from the Devonian-Permian flora of the Commonwealth. Luxuriance, plant variety, annual rings, and the like, are interpreted.
12. General features of the Mississippian floras of the Appalachian trough: W. Va. Geol. Survey, Mercer, Monroe, and Summers Counties, p. 837-843, 1926. The characteristic flora of the Pocono Formation and Chester Series type sections is listed and discussed. The Commonwealth is included. No details are given.
13. Pocono, orogeny, age, climate [abs.]: Geol. Soc. Amer., Proc. 1933, p. 119, 1934.
14. Lower Pennsylvanian species of *Mariopteris, Eremopteris, Diplothmema,* and *Aneimites* from the Appalachian region, a posthumous work assembled and

edited by Charles Brian Read: U. S. Geol. Survey, Prof. Paper 197-C, iii, p. 85-140, illus., 1943. Thirteen species of *Mariopteris,* ten of *Eremopteris,* twenty-one of *Diplothmema,* and nine of *Ancimites* are described. Not all are from the Commonwealth.

WHITE, CLYDE B.

1. (and Bell, James E.). Correll zinc mine, Lehigh County, Pa.: U. S. Bur. Mines, Rpt. Inv. 4180, 8 p. (#), illus., 1948. Sphalerite, calamine, and smithsonite occur in veins in fractured Ordovician limestone.

WHITE, ISRAEL CHARLES, 1848-1927. See also Ashley, George Hall, 28; Fontaine, William Morris, 1; Moyer, W. Irwin, 1.

1. Notes on the upper Coal Measures of West Virginia and Pennsylvania: Lyceum of Nat. Hist. New York, Annals 11, p. 46-57, 1874. The Upper [Pennsylvanian] section is described. A section is measured. No Permian is encountered.
2. Beaver Co., south from the Ohio River, *in* Greene and Washington district of the bituminous coal-fields of western Pennsylvania, by J. J. Stevenson: Pa. Geol. Survey 2nd, K, p. 334-349, 1876. The [Pennsylvanian] rocks of southern Beaver County are described. A section is measured, and coal beds are discussed.
3. Notes on the Coal Measures of Beaver Co., Pa.: Lyceum of Nat. Hist. New York, Annals 11, p. 14-18, 1876. A resumé of the [Pennsylvanian] section in the area is given. A section is measured, and the fossils are listed.
4. [edited by J. Peter Lesley]. Special report on the correlation of the coal measures in western Pennsylvania and eastern Ohio: Pa. Geol. Survey 2nd, QQ, p. 215-303, illus., 1877. Forty-five sections in the [Pennsylvanian] are measured and correlated. Fossils are listed. Correlations show the variability of the rocks.
5. The geology of Lawrence County: Pa. Geol. Survey 2nd, QQ, p. xxxvi, 1-213, illus. incl. geol. map, 1877. A complete geologic description of the area is given. [Pennsylvanian] and Quaternary deposits are present. Sections are measured; fossils are listed. Coal and iron are the chief resources.
6. Report of progress in the Beaver River district of the bituminous coal fields of [parts of Beaver, Allegheny, and Butler Counties] western Pennsylvania: Pa. Geol. Survey 2nd, Q, li, 337 p., illus. incl. geol. maps, 1878; discussion with title, On terrace levels in Pennsylvania, by J. P. Lesley; Amer. Jour. Sci. 3rd ser. 16, p. 68-69, 1878. A complete geologic description of the region is given. [Pennsylvanian] and Quaternary rocks are present. The structure is considered separately. Sections are measured; fossils are listed. Coal is the chief economic resource.
7. The geology of Mercer County: Pa. Geol. Survey 2nd, QQQ, xiv, 233 p., illus. incl. geol. map, 1880. A complete geological description of the area is given. [Mississippian], [Pennsylvanian], and Pleistocene rocks are exposed. Sections are measured; fossils are listed. Coal and iron are the mineral resources discussed.
8. Notes on the place of the Sharon conglomerate in the Paleozoic series: Amer. Phil. Soc., Proc. 19, p. 198-201, 1881; discussion by J. P. Lesley, p. 202-203. Evidence is given from the northwestern area that the Sharon conglomerate is equivalent in part to the [Pottsville] conglomerate.
9. The geology of Erie and Crawford Counties: Pa. Geol. Survey 2nd, QQQQ, p. xxi, 1-355, illus. incl. geol. map, 1881. A complete geologic description of the area is given. Devonian-[Pennsylvanian], and Pleistocene rocks are present. Much emphasis is placed on the stratigraphic description and correlation of these beds. Natural gas and stone are the two chief mineral resources. Sections are measured; fossils are listed.
10. The geology of Susquehanna County and Wayne County: Pa. Geol. Survey 2nd, G 5, xi, 243 p., illus. incl. geol. maps, 1881. A complete geologic study of the areas is given. Devonian-[Pennsylvanian] rocks are exposed; they are subdivided in detail. Sections are measured; fossils are listed. Glacial drift is described.
11. The geology of Pike and Monroe Counties: Pa. Geol. Survey 2nd, G 6, p. xxxiv, 1-333, 365-366, illus. incl. geol. map [of Wyoming County also], 1882; discussion with title, Supposed glacial striae on Locust Mountain, Pa., by

H. C. Lewis: Amer. Jour. Sci. 3rd ser. 26, p. 483-484, 1883. A complete geologic description of the area is given. Silurian-[Pennsylvanian] rocks are at the surface. The structure exposed in the water gaps is described. The glacial geology is discussed. Sections are measured; fossils are listed. No economic resources are described.

12. The geology of the [North Branch] Susquehanna River region in the six counties of Wyoming, Lackawanna, Luzerne, Columbia, Montour, and Northumberland: Pa. Geol. Survey 2nd, G 7, xxx, 464 p., illus. incl. geol. maps, 1883; preface by J. Hall; discussion with title, On the vertical range of certain fossils in Pennsylvania and New York, by E. W. Claypole: Amer. Naturalist 19, p. 644-655, 1885. A complete description of Silurian to [Mississippian] rocks of the area is given. The glacial geology is also described. Ore deposits are lead, zinc, and copper. None is important. The coal is deliberately left to another report. Sections are measured; fossils are listed.
13. Resumé of the work of the U. S. Geological Survey in the great Kanawha Valley . . . : The Virginias 6, p. 7-16, 1885; discussion by H. M. Chance, p. 40-41; reply by author, p. 44. A review of the [Pennsylvanian] rocks and coals in West Virginia uses the nomenclature of the Commonwealth. Chance discusses some of the details.
14. (and others). The geology of Huntingdon Co.: Pa. Geol. Survey 2nd, T 3, xv, 443 p., illus. incl. geol. maps, 1885. A complete geologic description of the area is given. Ordovician-[Pennsylvanian] rocks are present. The structure is described in detail; folds are most evident. Faults are present. Sections are measured; fossils are listed; analyses are made. Coal and iron ore are the chief economic products.
15. The geology of natural gas: Science 5, p. 521-522, 1885; discussion by C. A. Ashburner, 6, p. 42-43, 1885; reply by author, p. 43-44; reply by C. A. Ashburner, p. 184-185; Scientific American, Supplement 21, p. 8677-8678, 1886. The anticlinal control of gas accumulation in western Pennsylvania is pointed out. Ashburner opposed "general rules" proposed by White.
16. Rounded boulders at high altitudes along some Appalachian rivers [southwestern Pa.]: Amer. Jour. Sci. 3rd ser. 34, p. 374-381, 1887. Glacial deposits high above the rivers are used as evidence that the glacial rivers were "backed up" by an ice dam at Cincinnati and deposited their load as base level was attained. When the dam broke, downcutting occurred, creating the terraces.
17. The age of the Tipton Run coal of Blair County, Pennsylvania: Amer. Geologist 4, p. 25-28, 1889. Stratigraphic and paleontologic evidence shows that this coal belongs to the Allegheny Formation rather than the Pocono Formation as previously thought. A fault is present which had been previously undetected.
18. Stratigraphy of the bituminous coal fields of [western] Pennsylvania, Ohio, and West Virginia: U. S. Geol. Survey, Bull. 65, 212 p., illus. incl. geol. map, 1891. This is a comprehensive study of the stratigraphic succession and economic geology of the [Pennsylvanian] and Permian rocks of western Pennsylvania. Sections are measured; fossils are listed.
19. Origin of the high terrace deposits of the Monongahela River: Amer. Geologist 18, p. 368-379, 1896. Lake Monongahela was created when ice dammed the north-flowing Allegheny and Monongahela Rivers. When the lake filled, it drained southward. Terraces of clay, silt and boulders resulted along the river. The pre-glacial valleys are traced, and the terraces are described in detail.
20. A complete oil-well record in the McDonald field between the Pittsburgh coal and the fifth oil sand [Allegheny County] [abs.]: Jour. Geology 5, p. 103-104, 1897; Science ns 5, p. 93, 1897; Amer. Geologist 19, p. 422, 1897.
21. The Pittsburgh coal bed: Amer. Assoc. Adv. Sci., Proc. 46, p. 187-198, 1898; Amer. Geologist 21, p. 49-60, 1898. This coal is at the base of the Monongahela Formation. It may be Permian in age, but more likely it is [Pennsylvanian]. It occupies at least 4000-5000 square miles. It is the richest mineral deposit in the country. Its structures (partings, etc.) are described and measured.
22. The geology of the Pittsburgh district [abs.]: Science ns 16, p. 258-259, 1902.
23. The barren zone of the northern Appalachian coal field and its relations to Pittsburgh's industries: Amer. Mining Cong., 11th Ann. Session, Papers and

Addresses, p. 166-176, 1909. In the southwestern counties, the coal beds are not continuous; a barren unit underlies much of the area also. Its effects on reserve estimates are shown.

24. Note on a very deep well near McDonald [Washington County], Pa.: Geol. Soc. Amer., Bull. 24, p. 275-282, 1913. A well over 6000 feet deep is discussed. It passes from [Pennsylvanian] rocks down to the Oriskany sandstone where gas was obtained. The section is discussed.
25. Discussion of the records of some very deep wells in the Appalachian oil fields of Pennsylvania . . . : W. Va. Geol. Survey, Barbour and Upshur Counties, p. xxv-lxv, illus., 1918. The well records are given for wells in Washington (Silurian-[Pennsylvanian]), Tioga (Silurian-[Mississippian]), Armstrong (Devonian), and Westmoreland (Devonian-[Pennsylvanian]) Counties.
26. Records of three very deep wells drilled in the Appalachian oil fields of Pennsylvania and West Virginia [abs.]: Geol. Soc. Amer., Bull. 29, p. 96, 1918; discussion by C. E. Decker and F. R. Van Horn, p. 96-97.
27. Some results of deep drilling in the Appalachian oil and gas fields [abs.]: Geol. Soc. Amer., Bull. 31, p. 157, 1920; discussion by A. C. Lane, p. 157.
28. Memorial of John James Stevenson [1841-1924]: Geol. Soc. Amer., Bull. 36, p. 100-115, port., 1925.
29. (and Ashley, George Hall, and Bownocker, John Adams). The Pittsburgh coal bed: Amer. Inst. Mining and Metallurgical Engineers, Trans. 74, p. 481-503. illus., 1926; discussions, p. 503-506; in part with title, The Pittsburgh coal bed in Pennsylvania, by G. H. Ashley: Mining and Metallurgy 7 [as Trans. preprint 1602-F, 6 p., illus., 1926] 1926. A detailed description of the geography, stratigraphy and petrography of the unit is given. Sections are measured.

WHITLOCK, HERBERT PERCY

1. Crystallographic studies of fluorite [Chester County]: Amer. Museum, Novitates 472, 5 p., illus., 1931. A fluorite crystal from the Wheatley mine is described crystallographically.

WHITNEY, JOSIAH DWIGHT

1. (and Wadsworth, M. E.). The Azoic system: Harvard College Museum Comp. Zool., Bull. 7, no. 11, p. xvi, 331-565, 1884. A description of the Precambrian rocks of North America includes Pennsylvania. A resumé of other geologists' work is given. Two general divisions occur, the Laurentian and Huronian; the former is the [basement] and the latter is stratified. A discussion of the evidence of Precambrian life is included.

WHITTLESEY, CHARLES, 1808-1886.

1. The Allegheny coal field: Annals of Science [Cleveland Acad. Sci.] [2], p. 127-132, 1854. The [Pennsylvanian] rocks are described, and the presence of a large basin is demonstrated. The Commonwealth is included.
2. Abstracts of remarks upon the occurrence of iron in masses: Amer. Assoc. Adv. Sci., Proc. 16, p. 97-107, 1868. A description of the residual iron ore areas in the [Cambro-Ordovician] rocks is given. No details are included.
3. The Alleghany coal field: Cleveland Acad. Nat. Sci., Proc. 1, p. 99-113, 1874. A cursory review of the physical boundaries, coal, and stratigraphy is given for the whole Allegheny basin, part of which is in the Commonwealth.

WICKERSHAM, W.

1. [Traveling of rocks, York County] [abs.]: Boston Soc. Nat. Hist., Proc. 11, p. 285, 1868. Examples of creep are given.

WIELAND, GEORGE REBER

1. Observations on [Centre County] oölites: Mineral Collector 3, p. 100-102, illus., 1896. A general discussion of oolites considers those from Centre County. They may be pseudomorphs or submarine siliceous spring deposits.
2. Eopaleozoic hot springs and origin of the [Centre County] Pennsylvania siliceous oolite: Amer. Jour. Sci. 4th ser. 4, p. 262-264. illus., 1897. Oolitic-looking chert from other areas was deposited by hot springs: a similar origin for the [Ordovician] siliceous oolites is presented.

WILCOX, WALTER D.

1. Dr. Charles D[oolittle] Walcott [1850-1927]: Canadian Alpine Jour. 16, p. 231-234, port., 1928.

WILL, HOMER CHRISTIAN

1. The discovery of a mastodon in Huntingdon County: Pa. Acad. Sci., Proc. 10, p. 135, 1936. This is a brief announcement that mastodon bones have been found. They were near the surface in a swamp.

WILLARD, BRADFORD. See also Ashley, George Hall, 57; Butts, Charles, 18; Caster, Kenneth Edward, 5, 9; Chadwick, George Halcott, 6; Hickock, William Orville 4th, 4; McLaughlin, Dean Benjamin, 10; Ryan, John Donald, 1.

1. The age and origin of the Shawangunk formation: Jour. Paleontology 1, p. 255-258, illus., 1928. The eurypterid fauna and plants point to a Lower Silurian age for the formation. It is a marine equivalent of a delta of which the Green Pond Formation (in New York) is the subaerial portion.
2. Stratigraphic aspect of the Taconic disturbance [Northampton County]: Pan-Amer. Geologist 51, p. 93-96, 1929. The Shawangunk conglomerate unconformably overlies the Martinsburg Formation; two periods of Ordovician orogeny are recognized before the Silurian Shawangunk conglomerate was deposited. The second of the Ordovician orogenies was the more violent and is considered to be the Taconic.
3. Stratigraphic evidence for the Taconic disturbance in eastern Pennsylvania and New Jersey [abs.]: Geol. Soc. Amer., Bull. 40, p. 248, 1929.
4. Oriskany at Susquehanna Gap [Perry County], Pa.: Geol. Soc. Amer., Bull. 42, p. 697-706, illus., 1931. A small amount of Oriskany sandstone is preserved on top of Little Mountain. It is due to faulting. The fauna is similar to the Maryland fauna. The Upper Silurian and Lower Devonian beds are missing, possibly due to non-deposition.
5. Probability of the occurrence of the Oriskany sandstone in the Tioga region, *in* Gas in the Tioga region [Tioga County] Pennsylvania: Pa. Topog. Geol. Survey [4th ser.], Bull. 102, p. 8-12 (#), 1931. The characteristics, distribution, and relations of the Oriskany sandstone in this are are discussed. The Oriskany fauna is listed from New York which is different from that in the Commonwealth. Geologic factors are considered to explain the sand's absence in Tioga County.
6. Stratigraphy of the Tioga [Tioga County] region: Pa. Geol. Survey [4th ser.], Bull. 102-B, p. 9-14 (#), 1931. Silurian-Devonian formations are described. Subsurface sections are correlated with outcrops in New York.
7. A Marcellus fauna from Stroudsburg [Monroe County], Pa.: Amer. Jour. Sci. 5th ser. 24, p. 147-151, 1932. Thirty-six species of animals are listed. The relations to New York (88.5 percent) and Maryland (15.4 percent) suggest that the fauna is more nearly related to that of the New York Marcellus Formation. The fauna represents a current-borne assemblage swept into some deep, quiet embayment where the remains locally accumulated in profusion.
8. Devonian faunas in Pennsylvania: Pa. Geol. Survey 4th ser., G-4, 43 p., 1932. Fossils found at many localities in the Commonwealth where Devonian rocks are exposed are listed.
9. Fossil-hunting grounds in Pennsylvania: Pa. Acad. Sci., Proc. 6, p. 46-53, 1932. Fossil localities in rocks of Silurian-Mississippian age are listed. Most are in the northern and northeastern counties.
10. Glacial Lake Cowanesque [Tioga County]: Geol. Soc. Amer., Bull. 43, p. 441-448, illus., 1932. Glacial lake deposits occur in the Cowanesque River Valley. The lake occurred when the valley was dammed by ice. There were two stages, one during ice advance and another during retreat. Delta fans, varves, and clay are the evidence.
11. The Devonian section at Selinsgrove Junction [Northumberland County], Pa.: Amer. Midland Naturalist 13, p. 222-235, illus., 1932. Devonian rocks from the Helderberg Formation to the Chemung Formation are exposed along the Susquehanna River. The lithology and fauna of each formation is given. The "Catskill" is probably present as time only. Red beds are not present.
12. A new Chemung eurypterid from [Potter County] Pennsylvania: Amer. Midland Naturalist 14, p. 52-57, illus., 1933. One appendage of *Stylonurus shaffneri*, well preserved, is reported from the Chemung Formation. The faunal list is included.

13. "Catskill" sedimentation in Pennsylvania: Geol. Soc. Amer., Bull. 44, p. 495-516, illus., 1933. "Catskill" is used to describe red, Devonian, terrestrial sedimentary rocks, regardless of age. The base of the unit is older from the southwest to the northeast. The marine facies is the Chemung and Hamilton Formations. Sections are described.
14. Chemung of southwestern Pennsylvania: Pa. Acad. Sci., Proc. 7, p. 148-159, illus., 1933. Chemung Formation sections and faunas are listed from many localities. Correlation with Maryland rather than New York is suggested. The age of the highest Chemung rocks, below the Catskill redbeds, becomes younger northwestward.
15. [Geology of] Susquehanna-Juniata Valleys [Dauphin-Juniata Counties], trip 3: Field Conf. of Pa. Geologists, 3rd, p. 6-10 (#), Harrisburg, 1933. This is a detailed road log of a trip along the Susquehanna River from Harrisburg to Amity Hall and up the Juniata River a short distance. Few details are given.
16. [Geology of] Western Perry County, trip 5: Field Conf. of Pa. Geologists, 3rd, p. 14-16 (#), Harrisburg, 1933. A mimeographed road log of a trip in Silurian and Devonian rocks is given. No details are included.
17. (and Cleaves, Arthur Bailey). Hamilton group of eastern Pennsylvania: Geol. Soc. Amer., Bull. 44, p. 757-782, illus., 1933. The Hamilton group is divided into four formations. They are, from top to bottom: Moscow, Ludlowville, Skaneateles, and Marcellus. Each is divided into many members. The physical characteristics of each are described. Fossils are listed from many locations.
18. A Tully limestone outcrop in [Northumberland County] Pennsylvania: Pa. Acad. Sci., Proc. 8, p. 57-62, illus., 1934. The Tully limestone crops out near South Danville. The lithology and fauna are listed.
19. Additional Triassic dinosaur tracks from [Cumberland County] Pennsylvania: Science ns 80, p. 73-74, 1934. Tracks of *Anchisauripus sillimani* are reported from the Gettysburg shale near New Cumberland. Paleoecology is discussed.
20. Early Chemung shore line in Pennsylvania: Geol. Soc. Amer., Bull. 45, p. 897-908, illus., 1934. The Chemung shore line crossed Pennsylvania from Fulton County northeastward to Susquehanna County. Three deltaic lobes with intervening bays are outlined. The source of the Catskill Formation material in the deltaic lobes is considered. The lobes are deflected southward, suggesting current directions.
21. (and Jones, T. Husband). A new xiphosuran from the Allegheny of [Luzerne County] Pennsylvania: Pa. Acad. Sci., Proc. 9, p. 126-131, illus., 1935. *Euproöps packardi* is newly described from the "Baltimore seam" of the Allegheny Formation.
22. Chemung tracks and trails from [Susquehanna County] Pennsylvania: Jour. Paleontology 9, p. 43-56, illus., 1935. Trails in unquestioned Chemung shales are described. The animal, *Paramphibius,* is considered as a webfooted water-living form able to venture out on land. The evolutionary significance is discussed. Associated fauna and flora are described.
23. Devonian ice in [Huntingdon County] Pennsylvania: Jour. Geology 43, p. 214-219, illus., 1935. A shaly Portage sandstone has a striated surface. The fossils suggest cold water. The precise process of origin is uncertain, but possibly it was by ice-rampart-pushing.
24. Hamilton group along the Allegheny front, Pennsylvania: Geol. Soc. Amer., Bull. 46, p. 1275-1290, illus., 1935. The Hamilton group in central Pennsylvania can be divided into two formations, the Mahantango above and the Marcellus below. The Mahantango Formation can not be further physically subdivided as it can in eastern Pennsylvania. Sections are measured; fossils are listed.
25. Hamilton group of central Pennsylvania: Geol. Soc. Amer., Bull. 46, p. 195-224, illus., 1935. The Hamilton group ranges from 1100 to 1650 feet in thickness. Only the lower Marcellus and upper Mahantango Formations can be physically distinguished. The fauna is listed and compared. Various faunal facies can be detected. The Montebello and other sandstones are described and correlated.

26. *Hypothyridina venustula* (Hall) in [Northumberland County] Pennsylvania: Amer. Jour. Sci. 5th ser. 29, p. 93-97, illus., 1935. The appearance of this brachiopod has unquestionably identified the Tully limestone in the Commonwealth for the first time.
27. Middle-Upper Devonian contact in Pennsylvania: Pa. Acad. Sci., Proc. 9, p. 39-44, illus., 1935. Middle and Upper Devonian sandstone formations in eastern Pennsylvania are in transitional contact but are, to the west, separated by wedges of marine sediments, the Tully Formation being the base of the Upper Devonian. A cessation of clastic sedimentation in the west is implied.
28. Pennsylvania geology summarized: Pa. Topog. Geol. Survey [4th ser.]. Bull. 113, 13 p. (#), illus., 1935; 3rd ed., revised, Prog. Rpt. 113, illus., 1940. This is an extremely generalized, popular account of the geology of the Commonwealth. It is designed as a guide to basic geologic principles and locations for science teachers.
29. Portage group in Pennsylvania: Geol. Soc. Amer., Bull. 46, p. 1195-1218, illus., 1935. The Portage group is measured in detail in many places. The fauna is listed; sections are measured. Two formations occur; they are, from top to bottom: the Fort Littleton sandstone and the Rush Formation. The Portage group represents the early stages of offlap as the seas retreated in Late Devonian time. The Catskill Formation was deposited on top as the sea withdrew.
30. A Hamilton coral reef in [northeastern] Pennsylvania: Pa. Acad. Sci., Proc. 10, p. 30-36, illus., 1936. A prominent coral reef occurs at the base of the Ludlowville Formation from Pike County southwestward to Perry County. Corals are abundant, but other forms are present. The fauna is listed.
31. Continental Upper Devonian of northeastern Pennsylvania: Geol. Soc. Amer., Bull. 47, p. 565-608, illus. incl. geol. map, 1936. The Mississippian Mauch Chunk and Pocono Formations are described and their relations to the Catskill facies are discussed. Corrections are made in the 2nd Pennsylvania Survey work. Sections are measured; faunas and floras are listed. Correlation with the Allegheny Front area is suggested. The Devonian-Mississippian contact is identified.
32. Fossils in Pennsylvania: Scientific Monthly 43, p. 335-340, 1936. A popular account of the origin of fossils in the Commonwealth is given. Types of fossils in different systems are mentioned, but no specific localities are given.
33. (and Swartz, Frank McKim). [Geology of] area north and west of Harrisburg, trip A *of* Pa. Topog. Geol. Survey Centennial Celebration [Field Trip], p. 1-11 (#), [Harrisburg] 1936. This is a mimeographed guide to various localities in Perry County. Ordovician-Mississippian rocks are discussed. No details are given.
34. *Spirifer divaricatus* Hall in [Monroe County] Pennsylvania: Jour. Paleontology 10, p. 67-69, illus., 1936. This form is identified for the first time from the Hamilton group of the Commonwealth.
35. The Onondaga formation in Pennsylvania: Jour. Geology 44, p. 578-603, illus., 1936. The Onondaga Formation is described in detail, and its fauna is listed. It is composed of four units which are intergrading, but lithologically and faunally different. It is disconformable on the Oriskany Formation and gradational with the Marcellus Formation.
36. Devonian nomenclature in Pennsylvania: Pa. Acad. Sci., Proc. 11, p. 26-34, 1937. This is a historical review of the development of Devonian stratigraphic units, beginning in 1809 and going to date. Rogers' (1838) was cumbersome; White's (1885) was an improvement; Lesley's (1892) was almost modern. The section as known in 1937 is listed, along with its contributors.
37. Hamilton correlations: Amer. Jour. Sci. 5th ser., 33, p. 264-278, illus., 1937. The Hamilton group includes all of the Middle Devonian which, in the northeast, is related faunally and lithologically to New York. The section is complex, but becomes simpler to the south into Maryland and to the east into New Jersey. The Pennsylvania section serves to unite the north, east, and south. The Hamilton group, from top to bottom, contains the Mahantango, Marcellus, and Onondaga Formations.

38. *Taeniaster* in [Cumberland County] Pennsylvania: Jour. Paleontology 11, p. 620-623, illus., 1937. *Taeniaster maximus* n. sp., an ophiuroid, is reported from the Martinsburg Formation of Ordovician age.
39. (and Miller, Arthur Keith). Tully limestone and fauna in Pennsylvania: Geol. Soc. Amer., Bull. 48, p. 1237-1256, illus., 1937. The Tully Formation is described, and sections are measured from various localities along the Allegheny Front. The northern facies is platy and thicker; the southern facies is massive but thinner. The fauna is similar to the Tully fauna in New York; a few fossils are new. The fauna is listed.
40. A Paleozoic section at Delaware Water Gap [Monroe County]: Pa. Geol. Survey 4th ser., G-11, iv, 35 p., illus. incl. geol. map, 1938. Ordovician-Pennsylvanian rocks are described and correlated. Fossils are listed and the structure is briefly considered. A road log accompanies the report.
41. (and Cleaves, Arthur Bailey). A Paleozoic section in south-central Pennsylvania: Pa. Geol. Survey 4th ser., G-8, iv, 38 p., illus. incl. geol. map, 1938. This is a guidebook to the geology along the Susquehanna River from Harrisburg to Newport on the Juniata River. Lower Ordovician-Triassic rocks are exposed. Fossils are listed.
42. Evidence of Silurian land plants in [Schuylkill County] Pennsylvania: Pa. Acad. Sci., Proc. 12, p. 121-124, 1938. Carbonaceous layers in Bloomsburg red shale establish the presence of a Silurian land flora aboundant enough to have produced considerable free carbon.
43. (and Whitcomb, Lawrence). Onondaga paint-ore fauna from [Carbon County] Pennsylvania: Jour Paleontology 12, p. 511-513, 1938. A fauna collected from the paint ore of the Onondaga Formation is atypical. There is a paucity of mollusks and an unusually large number of species of trilobites.
44. (and Raymond, Percy Edward). Ordovician correlations in south-central Pennsylvania [abs.]: Geol. Soc. Amer., Proc. 1937, p. 119-120, 1938.
45. Devonian system along the Allegheny Front, Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 50, p. 1992-1993, 1939.
46. Guide to the geology from Dauphin [Dauphin County] to Sunbury [Northumberland County]: Pa. Geol. Survey 4th ser., G 13, 24 p., illus., 1939. A trip is illustrated along the Susquehanna River. Silurian-Pennsylvanian rocks are exposed. The glacial geology is also described. Fossils are listed. A detailed itinerary and sketch map are included.
47. Guide to the geology of the upper Schuylkill valley [Schuylkill-Berks Counties]: Pa. Geol. Survey 4th ser., G 14, 23 p., illus., 1939. A trip is illustrated and described along the Schuylkill River from Leesport to Pottsville. The physiography is described in detail. Ordovician-Pennsylvanian rocks are present. Fossils are listed. A detailed itinerary is included.
48. (and Fraser, Donald McCoy). Guidebook to the geology near Reading [Berks County], Pa.: Pa. Geol. Survey 4th ser., G-15, 27 p., illus. incl. geol. map, 1939. Precambrian to Pleistocene rocks are exposed; the structure is discussed.
49. Highway geology, Philadelphia to Pittsburgh: Pa. Geol. Survey 4th ser., G-12, 42 p., illus. incl. geol. maps, 1939. This is a guidebook to a trip along U. S. Routes 30, 230, and 22. Rocks of Precambrian-Ordovician, Triassic, and Quaternary age are visited. Lancaster, Harrisburg, and Hollidaysburg are *en route.*
50. Ordovician shales of southeastern Pennsylvania: Pa. Acad. Sci., Proc. 13, p. 126-133, illus., 1939. The Martinsburg Formation contains several recognizable units. They are, from top to boton: (1) Schochary sandstone, (2) Jonestown beds, and (3) dark shale with limestone interbedded near the base. The Fairview sandstone in southern Pennsylvania is an equivalent of the Schochary sandstone. The Cocalico shale, farther south, is stratigraphically below the dark shale unit at the base. The structure of the whole is a broad synclinorium.
51. (and Cleaves, Arthur Bailey). Ordovician-Silurian relations in Pennsylvania: Geol. Soc. Amer., Bull. 50, p. 1165-1198, illus., 1939. The Bald Eagle Formation and Juniata Formation lie between the Martinsburg and Tuscarora Formations to the west of the Susquehanna River. Eastward, the Juniata Formation pinches out and still farther east the Bald Eagle Formation is absent.

The base of the Silurian System is the Tuscarora Formation, regardless of which beds underlie it. Faunas are listed; sections are measured.

52. Stratigraphy and structure of the Kittatinny (Blue) Mountain gaps, *in* Northampton County, by B. L. Miller: Pa. Geol. Survey 4th ser., C-48, p. 145-158, illus., 1939. Ordovician and Silurian beds are exposed in the gaps. The gaps are cut in almost vertical beds on the southern limb of a syncline. The gaps are compared stratigraphically and physically. Many caves are discussed.
53. (and others). The Devonian of Pennsylvania: Pa. Topog. Geol. Survey 4th ser., G 19, xii, 481 p., illus. incl. geol. maps, 1939. This contains separate parts which are cited individually. A complete description of the Devonian exposures in the Commonwealth is given. Many sections are measured; fossils are illustrated. Maps outline the outcrops of all the major units. A geologic history is included.
54. Manus impression of *Anchisauripus* from [York County] Pennsylvania: Pa. Acad. Sci., Proc. 14, p. 37-39, illus., 1940. Tracks of a theropod dinosaur are described from the Gettysburg shale near Yocumtown.
55. Recurrent Paleozoic continental facies in Pennsylvania: New York Acad. Sci., Annals 40, p. 267-287, illus., 1940; Lehigh Univ. Inst. Research, Circ. 171, 1941. Continental formations are present in the geosyncline from Ordovician to Triassic time. Each is described and correlated. Color as a determining factor is considered. The proportion of continental sediments increases in younger sediments. The fauna is considered. The centers and boundaries of deposition shifted westward in succeeding younger time.
56. Martinsburg formation, *in* Lehigh County, Pennsylvania, by B. L. Miller: Pa. Geol. Survey 4th ser., C-39, p. 213-228, illus., 1941. A complete description of this formation in the county is given. Evidence for two units is given. Fossils are listed.
57. The Harrisburg axis: Pa. Acad. Sci., Proc. 15, p. 97-102, illus., 1941. A positive area occurred in southeastern Pennsylvania during Ordovician-Devonian time. At times it was submerged and the resulting rocks can be correlated on either side; when it was emergent, sedimentation on either side was not similar, and the resulting formations are absent at its axis. It was a peninsula projecting northwestward from Appalachia.
58. Cultural influences of Pennsylvania's mountain gaps: Scientific Monthly 57, p. 33-43, 132-144, illus., 1943. A popular account of the origin of the Commonwealth's wind and water gaps and their influence on the geographic development of the country is given.
59. New Pennsylvanian insect locality near Wilkes-Barre [Luzerne County] [abs.]: Pa. Acad. Sci., Proc. 17, p. 101, 1943.
60. Ordovician clastic sedimentary rocks in Pennsylvania: Geol. Soc. Amer., Bull. 54, p. 1067-1121, illus., 1943. The Martinsburg Formation was deposited; the Taconic disturbance occurred, and the Bald Eagle Formation and Juniata red beds were deposited, in that order, to the west of the Susquehanna River. Sections are measured; fossils are listed.
61. Devonian sequence near Huntingdon [Huntingdon County], Pennsylvania: Pa. Acad. Sci., Proc. 19, p. 126-133, illus., 1945. The entire Devonian section from the Catskill Formation on the top, to the Helderberg limestone at the base, may be seen in a composite section in the area. Sections are measured; fossils are listed.
62. Continental-marine Mississippian relation in northern Pennsylvania: Geol. Soc. Amer., Bull. 57, p. 781-795, illus., 1946. The continental Pocono Formation passes into the marine Knapp Formation. The Knapp Formation is Kinderhookian. Upper Devonian rocks underlie the Knapp Formation and Lower Pennsylvanian rocks overlie it. The Mauch Chunk Formation thins out to the west and north from the anthracite basin and disappears. Sections are measured.
63. Origin of the Lackawanna Basin [Luzerne-Lackawanna Counties], Pennsylvania: Jour. Geology 54, p. 246-251, illus., 1946. A rapid thinning of Mississippian rocks in this area created a zone of weakness which was downwarped during the Appalachian Revolution. This downwarp has preserved the Mississippian and Pennsylvanian rocks in the northern anthracite basin.

64. (and others). [Geology of the Bethlehem area, Lehigh and Northampton Counties]: Field Conf. of Pa. Geologists, [13th], 14 p. (#), [Bethlehem] 1947. This is a road log and itinerary of a series of field trips to various geologic features in the region. Precambrian to Ordovician, and Pleistocene rocks are visited; no details are included.

65. (and McLaughlin, Dean Benjamin, and Ryan, John Donald). Triassic of the Delaware Valley [Northampton County] [abs.]: Geol. Soc. Amer., Bull. 58, p. 1240-1241, 1947.

66. Coal evolution in Pennsylvania: Pa. Acad. Sci., Proc. 22, p. 117-121, 1948. A combination of climate and paleogeography is considered to explain why coal occurs in some periods and not in others. A cool, moist climate is favored, and each period is considered from this point of view.

67. (and Swartz, Frank McKim). [Geology along] Susquehanna and Juniata Valleys [Dauphin-Perry Counties]: Field Conf. of Pa. Geologists, 14th, 8 p. (#), [Harrisburg] 1948. A mimeographed, detailed itinerary and road log, visiting Ordovician to Mississippian rocks along the river valleys, are given

68. Paleozoic continental phases of sedimentation in the northern Appalachians [abs.]: Internatl. Geol. Cong., 18th, London 1948, Volume of titles and abstracts, p. 23, 1948.

69. Cambrian stratigraphic nomenclature in eastern Pennsylvania [abs.]: Geol. Soc. Amer., Bull. 60, p. 1976-1977, 1949.

WILLCOX, JOSEPH, 1829-1918.

1. [Corundum from Unionville, Chester County]: Acad. Nat. Sci. Phila., Proc. [24] 1872, p. 266, 1873. A corundum crystal is described, from near Unionville, which has been altered to chlorite on the outside. There is a complete gradation.

2. Notes on the serpentine beds of Chester and Delaware Cos., with their associated minerals, corundum, chromite, etc.: Pa. Geol. Survey 2nd, C 4, p. 346-351, 1883; discussion by J. P. Lesley, p. 351-354. The serpentine has resulted from the alteration of basic rocks in the area. Limonite and "cellular" quartz are common alteration products. Corundum is present in the serpentine and is associated with albite which has also been mined. Asbestos and steatite have been found also.

WILLIAMS, CHARLES REGAN. See Billings, Marland Pratt, 1.

WILLIAMS, EDWARD HIGGINSON, JR. See also Wright, George Frederick, 13.

1. Glaciation in [Lehigh County] Pennsylvania: Science 21, p. 343, 1893. Boulders of Oriskany sandstone to the north of [First Mtn.] on the hills around Bethlehem and Lehigh University indicate that glacial ice has been farther south than the Great [Wisconsin] Moraine. An earlier glacial epoch is proposed.

2. South Mountain glaciation [Lehigh-Northampton Counties]: Geol. Soc. Amer., Bull. 5, p. 13-15, 1893. Boulders of Oriskany and Medina sandstone reported on the south side of South Mountain [Reading Prong] suggest that the glaciers extended this far south. None was found on the north side. The ice went as far south as the Triassic hills.

3. Extramorainic drift between the Delaware and the Schuylkill [Lehigh-Northampton Counties]: Geol. Soc. Amer., Bull. 5, p. 281-296, illus., 1894. Numerous types of deposits to the south of the terminal moraine are called the "fringe." The Packer lake clay, drumlins (?), kames, and morainic material are described. The clay overlies the other deposits.

4. The age of the extra-moraine fringe in [Lehigh County] eastern Pennsylvania: Amer. Jour. Sci. 3rd ser. 47, p. 34-37, 1894. The fringe is of extremely recent origin and does not antedate the [Wisconsin] Great Moraine. The section around Bethlehem is used as an example. The material is oxidized and fresh. The oxidized parts are angular and poorly sorted; the fresh is rounded and glacial. The rock over which the glaciers flowed is included in the ground moraine but is not present very far to the south of the terrane. The surface outcrops are fresh and undecomposed. The interglacial interval was short if there was any. Till is continuous across the Great Valley. There was one short, recent ice age.

5. Notes on the southern ice limit in eastern Pennsylvania: Amer. Jour. Sci. 3rd ser. 49, p. 174-185, illus., 1895. Features of ice advance are described. They include the Schuylkill, Juniata, and Susquehanna River gravels, anthracite-region drift, and the effect of the ridges on ice advance. The lower part of the ice moved approximately along the ridges, while the upper part of the ice moved across them.
6. Notes on Kansan drift in Pennsylvania [abs.]: Amer. Geologist 18, p. 237-238, 1896.
7. The "Kansan" glacial border: Science ns 4, p. 229-230, 1896. [Pre-Wisconsin] till in the northwestern counties is different from [pre-Wisconsin] till in the northeastern counties. The amount of weathering on the [pre-Wisconsin] drift in the northwestern area indicates that if there were two glacial epochs, they were closely allied and not very remote.
8. The Mammoth bed at Morea [Schuylkill County], Pa.: Science ns 3. p. 782-783, 1896. A section, from top to bottom is described as: (1) till, with much Pottsville Formation material, (2) crushed anthracite, (3) rotten anthracite, with some slate chips, (4) sandy clay, slate fragments and rounded and angular pebbles, (5) crushed anthracite, (6) glaciated outcrop surface, and (7) anthracite bed. The recent date of the glaciation is stressed since the crushed anthracite is so fresh.
9. Greenland glaciers: Science ns 5, p. 448, 1897. Examples from the eastern part of the Commonwealth show that angular ridges and peaks occur within glaciated regions. The deposition on the ridges has crept down to the valleys, and little evidence of the glacial action remains.
10. Notes on Kansan drift in Pennsylvania: Amer. Phil. Soc., Proc. 37, p. 84-87, illus., 1898. Kansan drift is considered as all the drift south of the "first great moraine," not necessarily recognizing any age distinction. The ice came in two lobes, the eastern and the western. Native copper in the western area shows the ice came from the northwest. There is no copper in the eastern moraines. The size and number of moraines in the two different areas also suggests the two sources.
11. The alleged Parker channel [Clarion County]: Geol. Soc. Amer., Bull. 12, p. 463, 1901. The channel was pre-glacial because it is filled with glacial debris, outwash, and local creep. The gorge of the Allegheny River suggests that the meltwater went out that way and left the pre-glacial Parker channel abandoned.
12. Kansan glaciation and its effect on the river system of northern Pennsylvania: Wyoming Hist. Geol. Soc., Proc. 7, p. 21-28, illus., 1902. Many of the rivers were ponded by the glacial ice. These lakes are described and pre- and post-glacial water courses are shown. Much glacial filling in the valleys has occurred, and uplift has created the glacial-gravel terraces.
13. Pennsylvania glaciation, first phase—materials for a discussion of the attenuated border of the moraine described in volume Z of the Second Geological Survey of Pennsylvania: 101 p., illus., Woodstock, Vt., 1917. The advance and routes of the glaciers in the northern part of the Commonwealth are discussed. Much of the earliest drift was deposited by meltwater. The stratigraphy of the drift is described. Effects of topography and lithology on the ice movement are considered. Lakes were common features.
14. The deep Kansan pondings in Pennsylvania and the deposits therein: Amer. Phil. Soc., Proc. 59, 5, 49-84, illus., 1920. Pondings were against divides and moraine dams. Examples from many places in the Commonwealth are shown.

WILLIAMS, FRANCIS JESSE. See Honess, Arthur Pharaoh, 4.

WILLIAMS, GEORGE HUNTINGDON, 1856-1894.

1. On a geological excursion in the northern Appalachian chain [abs.]: Johns Hopkins Univ., Circ. 10, p. 27-28, 1890.
2. The volcanic rocks of South Mountain in [Adams-Franklin Counties] Pennsylvania and Maryland: Amer. Jour. Sci. 3rd ser. 44, p. 482-496, illus., 1892. Rhyolite and basalt, tuff and breccia are described petrographically and geographically; though metamorphosed, they are shown to be of original igneous origin. They were previously thought to be originally sedimentary.
3. Piedmontite and scheelite from the ancient rhyolite of South Mountain [Franklin County], Pa.: Amer. Jour. Sci. 3rd ser. 46, p. 50-57, illus., 1893.

Acid and basic lavas have been epidotized, and when manganese is present, piedmontite results. It occurs as minute crystals in scheelite which is described. It occurs as radiating aggregates in veins, and as a microscopic constituent of rhyolite. Analyses and mineralogic descriptions are made.

4. Sixth annual excursion of the Geological Department, May 25-June 5, 1893: Johns Hopkins Univ., Circ. 13, p. 26-27, 1894. A field trip in central Pennsylvania is discussed. The Paleozoic section is described.
5. The distribution of ancient volcanic rocks along the eastern border of North America: Jour. Geology 2, p. 1-31, illus., 1894. A treatise on the recognition of Precambrian volcanic rocks includes a description of those in the Blue Ridge. It shows the effects of metamorphism and relict volcanic flow features. Pyroclastic rocks are present. Little detail is given.

WILLIAMS, HENRY SHALER, 1847-1918. See also White, Charles David, 2.

1. Catalogue of the fossils of the Chemung period of North America: 14 p., [Ithaca, New York, 1882] [not seen].
2. On the fossil faunas of the Upper Devonian along the meridian of 76°30′ from . . . to Bradford County, Pa.: U. S. Geol. Survey, Bull. 3, 36 p., 1884. Faunal lists of Upper Devonian are given from not-too-well identified locations, some in the county. Various "faunas" are discussed as characteristic of certain formations.
3. Notice of a new limuloid crustacean from the Devonian [Erie County]: Amer. Jour. Sci. 3rd ser. 30, p. 45-49, illus., 1885; Geological Mag. 3rd ser. 2, p. 427-429, London, 1885; discussion with title, Note on the xiphosuran *Prolimulus eriensis* Williams, by E. R. Ellers: Carnegie Museum, Annals 27, p. 155-158, illus., 1938. *Prestwichia eriensis* is described from the "3rd oil sand" of the Chemung Formation near LeBoeuf. Its associated fauna is listed. Ellers calls it a lumulid xiphosuran.
4. On the different types of the Devonian system in North America: Amer. Jour. Sci. 3rd ser. 35, p. 51-59, 1888. The Devonian of the Commonwealth is very briefly described. Similarities and differences with other areas are noted. The difficulties of selecting a type area are pointed out. Fossil boundaries are recommended.
5. Report of the subcommittee on the Upper Paleozoic [Devonic]: Amer. Geologist 2, p. 225-247, 1888. In an attempt at international agreement on Devonian correlations, the Commonwealth is included.
6. Correlation papers—Devonian and Carboniferous: U. S. Geol. Survey, Bull. 80, 279 p., 1891. This is a historical account of the development of the ideas on the correlation of the Devonian, Mississippian, and Pennsylvanian Systems. Many original ideas came from data obtained in the Commonwealth.
7. James Dwight Dana [1813-1895] and his work as a geologist: Jour. Geology 3, p. 601-621, 1895.
8. Shifting of faunas as a problem of stratigraphic geology: Geol. Soc. Amer., Bull. 14, p. 177-190, illus., 1903. The Devonian rocks of the Commonwealth are used as an example of the environmental control of fossil distribution. Physical and paleontological correlations are made.
9. (and Kindle, Edward Martin). Fossil faunas of Devonian sections in central and northern Pennsylvania, part 2 *of*, Contributions to Devonian paleontology, 1903: U. S. Geol. Survey, Bull. 244, p. 59-144, illus., 1905; addition with title, Bearing of some new paleontologic facts on nomenclature and classification of sedimentary formations: Geol. Soc. Amer., Bull. 16, p. 137-150, 1905. Sections of Devonian rocks are measured in detail and the faunas are listed. All are post-Oriskany Formation in position. Correlations are made of the Chemung Formation and Catskill Formation sections.

WILLIAMS, JAMES STEELE

1. Memorial to George Herbert Girty [1869-1939]: Geol. Soc. Amer., Proc. 1939, p. 195-205, port., 1940; Wash. Acad. Sci., Jour. 30, p. 487-488, 1940.

WILLIAMS, T.

1. (and others). George Huntingdon Williams . . . 1856-1894: 150 p., port. [N. Y.], 1896.

WILLIAMS, KENNETH THURMAN. See Lohman, Stanley William, 1.

WILLIAMS, W. A.

1. A geological and topographical map of Pennsylvania and New Jersey . . . : Scale, 1 inch equals 8 miles, Descher, Philadelphia, 1857.

WILLIG, H. L.

1. Limonite pseudomorphons after pyrite from Lancaster Co., Pa.: Amer. Mineralogist 3, p. 2, 1918. Pseudomorphs are described from a location north of Lancaster.

WILLING, E. S., JR.

1. A field study in the relationship of Baltimore gneiss, Cockeysville marble, and Wissahickon schist in the vicinity of Marshallton [Chester County], Pennsylvania: M.A. thesis, Bryn Mawr College, 1949.

WILLIS, BAILEY, 1857-1949.

1. Report on certain magnetites in eastern Pennsylvania: U. S. 10th Census 15, p. 223-234, illus., 1886. The magnetite deposits associated with the Triassic diabase are described. The origin of some of the larger deposits is considered, and each of the individual deposits is described.
2. (and Hayes, C. Willard). Conditions of Appalachian faulting: Amer. Jour. Sci. 3rd ser. 46, p. 257-268, illus., 1893. The Appalachians as a whole are considered, and examples from the Commonwealth are used. Differential system thicknesses indicate contemporaneous sinking with sedimentation in the Appalachian geosyncline. The mechanisms of thrusting are considered.
3. The mechanics of Appalachian structure: U. S. Geol. Survey, Ann. Rpt. 13, Part 2, p. 211-281, illus., 1893; In part, with title, Studies in structural geology: Amer. Inst. Mining Engineers, Trans. 21, p. 551-566, 1893. The various structural features of the Appalachians, including the Commonwealth are described and interpreted from theoretical considerations and model construction.
4. The northern Appalachians: Natl. Geog. Soc., Mon. 6, p. 169-202, illus. [1895]; *in* The physiography of the United States: p. 169-202, illus., Natl. Geog. Soc., New York, 1896. The Appalachian Mts. of the Commonwealth are described in detail as to configuration and origin.
5. Carte géologique l'Amerique du Nord: Scale, 1:5,000,000. Internatl. Geol. Cong., 10th, 1906.
6. Paleogeographic maps of North America: Jour. Geology 17, p. 203-208, 253-256, 286-288, 342-343, 403-409, 424-428, 503-508, 600-602, maps, 1909. Small-scale maps, with accompanying text, show the sea-land distribution during the various epochs from the Cambrian to the Quaternary. The Commonwealth is included.
7. (and Stose, George Willis). Geologic Map of North America: Scale, 1:5,000,000. U. S. Geol. Survey, 1911.
8. Index to the stratigraphy of North America: U. S. Geol. Survey, Prof. Paper 71, 894 p., illus., 1912. This is the text to accompany the Geologic Map of the United States. Each portion of the column is outlined for individual areas, including the Commonwealth. Excerpts from significant stratigraphic papers are included.
9. Joseph Barrell [1869-1919], and his work: Jour. Geology 27, p. 664-672, 1919.

WILSON, ALFRED W. G.

1. Shoreline studies on Lakes Ontario and Erie [Erie County]: Geol. Soc. Amer., Bull. 19, p. 471-500, illus., 1908. The general character of the shore is discussed, and special features are described. Presque Isle, at Erie, is discussed in detail. Presque Isle is a hook of sand and gravel built of material from a western source. The reason why the hook is there is unknown.

WILSON, EUGENE BENJAMIN

1. The Cornwall [Lebanon County], Pa., magnetite deposits: Lake Superior Mining Inst., Proc. 16, p. 227-238, illus., 1911. A review of the geology of this area is included in an article dealing primarily with the milling and mining techniques.

WILSON, J. W.

1. Bursting of lakes through mountains: Amer. Jour. Sci. 3, p. 252-253, 1821. The presence of water gaps of different elevations precludes the possibility of a lake bursting through and creating the gaps simultaneously as supposed by some.

WILSON, JAMES LEE
1. The faunas and stratigraphic relations of the Gatesburg and Conococheague formations (Upper Cambrian) in the central Appalachians: Ph.D. thesis, Yale Univ., 1949.
2. Stratigraphy and faunal relationships of the Upper Cambrian in the central Appalachians [abs.]: Geol. Soc. Amer., Bull. 60, p. 1929-1930, 1949.

WILSON, JOHN HOWARD
1. A glacially formed lake in Susquehanna County, Pennsylvania: Amer. Geog. Soc., Bull. 46, p. 659-661, illus., 1914. Quaker Lake was dammed by a till deposit across the mouth of a tributary of Snake Creek.

WILSON, JOSEPH F.
1. Map of the United States . . . showing other [mineral] details: No scale [about 1:2,500,000], U. S. Genl. Land Office, 1868.

WINCHELL, ALEXANDER
1. American opinion on older rocks: Minn. Geol. Survey, Ann. Rpt. 18, p. 65-219, 1891. This is a condensation of opinions by the important geologists who have worked in [Precambrian] and lower Paleozoic rocks. H. D. Rogers is the big contributor to the Commonwealth, although others have been involved also.

WINCHELL, NEWTON HORACE, 1839-1914.
1. Delaware terraces [abs.]: Geol. Soc. Amer., Bull. 25, p. 86, 1914.

WINSLOW, ARTHUR
1. Peculiarities of weathering in the Pottsville conglomerate: Science 3, p. 12-14, illus., 1884. The hard, resistant Pottsville conglomerate is characterized by certain peculiar weathering features. Bedding planes weather deeply; differential weathering is parallel to the bedding. Joints are opened widely by frost action. Peculiar surface features are illustrated.
2. (and Hill, Frank A.). The Lehigh River cross section . . . : Pa. Geol. Survey 2nd, Ann. Rpt. 1886, Part 4, p. 1331-1371, illus. incl. geol. maps, 1887. Detailed measured sections of Silurian-[Mississippian] formations are given. A continuous strip map from Plymouth Township, Luzerne County, along the Lehigh River to Lehigh Gap is included. Columnar sections and descriptions are given.
3. Charles Albert Ashburner [1854-1889]: Amer. Geologist 6, p. 69-78, port., 1890.

WISTAR, ISAAC J.
1. Iron oxide as coloring matter in the rocks of the anthracite region [abs.]: Amer. Geologist 17, p. 261-262, 1896; Science ns 3, p. 488-489, 1896.

WISTER, CHARLES I.
1. Description of melanite from [Philadelphia County] Pennsylvania . . . : Amer. Mineralogical Jour. 1, p. 31, 1814. Crystals of melanite are reported from the feldspathic gneiss in Germantown. No specific location is given. The crystals are described.

WITMER, J. DONALD
1. A new Silurian crinoid from [Juniata County] central Pennsylvania: Pa. Acad. Sci., Proc. 11, p. 75-78, illus., 1937. The camerate *Dimerocrinus mifflinensis* is reported from the Keefer sandstone near Mifflintown. Calices are usually rare in the Silurian rocks of this area.

WOOD, HORATIO CHARLES, JR.
1. Catalogue of Carboniferous plants in the museum of the Academy of Natural Sciences, with corrections in synonomy, descriptions of new species, etc.: Acad. Nat. Sci. Phila., Proc. [7] 1860, p. 436-443, 1861. Many genera and species are listed. A few are from Pennsylvania.
2. Contributions to the Carboniferous flora of the United States: Acad. Nat. Sci. Phila., Proc. [7] 1860, p. 236-240, 519-522, 1861. Many genera and species of plants are described; many are new. Most are from the anthracite fields.
3. A contribution to the knowledge of the flora of the coal period in the United States: Amer. Phil. Soc., Trans, ns 13, p. 341-349, illus., 1869. In a description and reclassification of paleobotanical material, references are made to other publications, many about the Commonwealth.

WOODHOUSE, JAMES

1. [Manganese from Northampton County]: Phila. Medical Museum 1, p. 449-451, 1805. Manganese from "the neighborhood of the Lehigh" is reported "in great quantity."
2. An account of the Perkiomen zinc mine [Chester County], with an analysis of the ore: Phila. Medical Museum 5, p. 133-135, 1808. The lead and zinc ores are described and analyzed.

WOODWARD, ARTHUR SMITH

1. Edward Drinker Cope [1840-1897]: Natural Science 10, p. 377-381, port., London, 1897.
2. Dr. John M[ason] Clarke [1857-1925]: Nature 116, p. 368, London, 1925.
3. Dr. C[harles] D[oolittle] Walcott [1850-1927]: Nature 119, p. 325-326, London, 1927.

WOODWARD, HENRY

1. Obituary, Prof. Henry Carvill Lewis [1853-1888]: Geological Mag. 3rd ser. 5, p. 428-430, London, 1888.
2. Othniel Charles Marsh [1831-1899]: Geological Mag. 4th ser. 6, p. 237-240, port., London, 1899.

WOODWARD, HERBERT PRESTON

1. Paleozoic formations east of the main axis of the Appalachian uplift [abs.]: Geol. Soc. Amer., Proc. 1934, p. 455, 1935.
2. Interpretation of Appalachian geomorphic history [abs.]: Geol. Soc. Amer., Bull. 49, p. 1965, 1938.

WOOLLARD, GEORGE PRIOR

1. An interpretation of gravity-anomalies in terms of local and regional geologic structures: Amer. Geophysical Union, Trans. [17] Part 1, p. 63-74 (#), illus., 1936. The Commonwealth is included in a discussion of the U. S. Anomalies in Pennsylvania are related to geology. The geology appears to explain the anomalies in every case.
2. Gravitational determination of deep-seated crustal structure of continental borders (Structural interpretation of gravity-observations): Amer. Geophysical Union, Trans. [21], p. 808-815, illus., 1940. The Commonwealth is included in a discussion of the Appalachian gravity trends. A series of crests and troughs of gravity anomalies trend northeast-southwest across Pennsylvania. There is a marked western anomaly-trough underlying the overthrust zone of the Piedmont which may be due to (1) a buried trough of low-density material, (2) a down-buckled tectogene associated with an island arc, or (3) a downwarped, thickened section of the crust due to overthrusting.
3. Geologic correlation of areal gravitational and magnetic studies in New Jersey and vicinity: Geol. Soc. Amer., Bull. 54, p. 791-818, illus., 1943. A regional gravity map of many states including the Commonwealth is given. Relations to the geology are discussed. The anomaly trends are parallel to the geological trends. A negative anomaly occurs to the east of the Piedmont front, and a positive anomaly is to the west. They cannot be explained by known geology. Basement lithology seems to have the greatest effect, with there being some genetic relationship to the folded Palezoic rocks.
4. Transcontinental gravitational and magnetic profile of North America and its relation to geologic structure: Geol. Soc. Amer., Bull. 54, p. 747-789, illus., 1943. The Commonwealth is included. Interpretations are made as to whether the effect is primarily from surface or basement material. The southwestern area seems to have sedimentary rock influence, for instance. Some high readings in the folded rocks suggest basement influence, probably an unlift. There is little variation from Harrisburg to New Jersey. Strip maps are included.
5. Regional gravity survey of northeastern United States and eastern Canada [abs.]: Geol. Soc. Amer., Bull. 57, p. 1245-1246, 1946.
6. Regional gravity study of the Appalachian Mountain system [abs.]: Geol. Soc. Amer., Bull. 60, p. 1932, 1949.

WOOLMAN, LEWIS

1. Oriskany sandstone in Lycoming Co., Pa.: Acad. Nat. Sci. Phila., Proc. [38] 1886, p. 296-297, 1886. Oriskany sandstone is reported from Pennsville in the

county where it was considered absent in the Second Survey bulletins. It forms a ridge, but which is not as characteristic as elsewhere.

2. Marine and fresh-water diatoms and sponge spicules from the Delaware River clays of Philadelphia [Philadelphia County]: Acad. Nat. Sci. Phila., Proc. [42] 1890, p. 189-191, 1890. The fossils are not described, but they point to the presence of marine clay below the city. It is interpreted as estuarine clay from the Delaware Bay when it extended farther north.

WOOLSEY, LESTER HOOD

1. Clays of the Ohio Valley in [Beaver County] Pennsylvania: U. S. Geol. Survey, Bull. 225, p. 463-480, 1904. Clay comes from [Pennsylvanian] shales of many levels, some being fire clay. Local beds and deposits are described. There is some Quaternary clay along the rivers on the terraces also. Analyses are given.
2. Extramorainic pebbles in western Pennsylvania [abs.]: Science ns 19, p. 733, 1904.
3. Description of the Beaver quadrangle [Allegheny-Beaver Counties]: U. S. Geol. Survey, Geol. Atlas of U. S. folio 134, 15 p., illus. incl. geol. map, 1905. A complete geologic description is given. [Pennsylvanian] and Pleistocene deposits are mapped. Gentle folds characterize the structure. Various peneplains and levels are recognized. Coal is the chief mineral resource. Clay, shale, oil and gas, limestone, and sandstone are also described. Sections are measured.
4. Economic geology of the Beaver quadrangle, Pennsylvania, (southern Beaver and northwestern Allegheny Counties): U. S. Geol. Survey, Bull. 286, 132 p., illus., 1906. Devonian-[Pennsylvanian] rocks are described. The coal beds are described also. Clay, shale, petroleum, gas, limestone, sandstone, and sand are the other mineral resources; each is discussed. Well logs are given.

WORTMAN, JACOB LAWSON

1. Othniel Charles Marsh [1831-1899]: Science ns 9, p. 561-565, port., 1899.

WRIGHT, ALBERT ALLEN, 1846-1905.

1. Older drift in the Delaware Valley: Amer. Geologist 11, p. 184-186, 1893; discussion by R. D. Salisbury, p. 360-362. Deeply weathered drift in the valley south of the terminal moraine suggests that it is older than [Wisconsin], or at least older than the terminal moraine. It has the same composition as the drift of the terminal moraine.

WRIGHT, ANNA Z. See Wright, Frank James, 1.

WRIGHT, FRANK JAMES

1. (and Wright, Anna Z.). Memorial to Douglas [Wilson] Johnson [1878-1944]: Geol. Soc. Amer., Proc. 1944, p. 223-239, port., 1945.

WRIGHT, FREDERICK BENNETT

1. The origin of the Wind Gap [Monroe County]: Amer. Geologist 18, p. 120-123, illus., 1896. The stream from Wind Gap was [pirated] by the larger streams in Delaware or Lehigh Water Gaps as all three streams cut down through Blue Mountain.

WRIGHT, GEORGE FREDERICK, 1838-1921.

1. The southern limit of ancient glaciers in Pennsylvania [abs.]: Amer. Naturalist 16, p. 753-754, 1882.
2. The terminal moraine in Pennsylvania [abs.]: Essex Inst., Bull. 14, p. 71-73, 1882.
3. Result of explorations of the glacial boundary between New Jersey and Illinois [abs.]: Science 2, p. 316-317, illus., 1883; Amer. Assoc. Adv. Sci., Proc. 32, p. 202-208, illus., 1884. This is an expanded abstract. The glacial boundary is traced across the Commonwealth. Certain marked features are described which are used to trace the boundary.
4. The glaciated area of North America: Amer. Naturalist 18, p. 755-767, illus., 1884. A generalized description of the glacial boundary in the eastern United States, including the Commonwealth, is given.
5. The ice age in North America . . . : xviii, 622 p., illus., Appleton, New York, 1889; 5th ed., xxi, 763 p., illus., Bibliotheca Sacra Co., Oberlin, Ohio, 1911; 6th ed., 1920. In a treatise on the glacial geology of the nation, many examples are taken from the Commonwealth.

6. The age of the Philadelphia [Philadelphia County] red gravel: Boston Soc. Nat. Hist., Proc. 24, p. 152-157, 1890. When the ice was at its southernmost point, the glacio-fluvial material was deposited in the Delaware River. The withdrawal of the ice permitted rebound, and the gravels are now 50 feet above the river.
7. The glacial boundary in western Pennsylvania, Ohio, Kentucky, Indiana and Illinois: U. S. Geol. Survey, Bull. 58, 112 p., illus., 1890. The exact southern limit of till is determined. Striae, till, and erratics are the chief bits of data. An ice dam near Cincinnati created a lake as far up the Ohio River as Pittsburgh.
8. Unity of the glacial epoch: Amer. Jour. Sci. 3rd ser. 44, p. 351-373, illus., 1892. In support of a single glacial epoch, the origin of terraces in the Beaver and Susquehanna Rivers is described. They are floodplain levels which were covered with glacial debris when the rivers were ponded as a result of the northward tilting due to ice load.
9. Extramorainic drift in the Susquehanna, Lehigh, and Delaware Valleys: Acad. Nat. Sci. Phila., Proc. [44] 1892, p. 469-484, illus., 1893; abs., with discussion by R. D. Salisbury: Amer. Geologist 10, p. 219, 1892. The literature is reviewed and conflicts pointed out. The Susquehanna River terraces are described as glacial, as are those of the Lehigh and Delaware Rivers. Till is described south of the terminal moraine; the ice had actually advanced farther south than the terminal moraine.
10. Continuity of the glacial period: Amer. Jour. Sci. 3rd ser. 47, p. 161-187, illus., 1894. The paper is devoted to answering criticisms of a single glacial epoch. Examples are taken from the Ohio, Allegheny, and Delaware River valleys to explain the origin of multiple river terraces resulting from one continuous epoch. Damming and overflow seem to be important factors.
11. Glacial history of [Warren County] western Pennsylvania [abs.]: Amer. Geologist 13, p. 219-220, 1894.
12. The age of the Philadelphia [Philadelphia County] brick clay: Science ns 3, p. 242-243, 1896; discussion by R. D. Salisbury, p. 480-481, 1896. The river clays are called the Jamesburg clay; they were deposited by the sea when the area was submerged for a short period. Glacial boulders were ice-rafted out into it. The clay and gravel on the higher terraces are older than the river gorge, but they are still Pleistocene.
13. Postglacial erosion and oxidation [western Pa.]: Geol. Soc. Amer., Bull. 23, p. 277-295, illus., 1912; discussion by F. Leverett, H. L. Fairchild, and J. W. Spencer, p. 295-296; reply by author, p. 296; discussion with title, Allegheny Valley erosion, by E. H. Williams, Jr.; Science ns 37, p. 447-450, 1913. Examples from the Commonwealth are cited. The rushing meltwater threw gravel and sand to higher levels; the high-level material does not imply glacio-fluvial deposition and post-glacial erosion. The rivers in the western counties show examples. The oxidized till is mixed with unoxidized pebbles and has simply been re-deposited with fresh till. Multiple glaciation is questioned.
14. Evidence of a glacial dam in the Allegheny River between Warren [Warren County], Pa., and Tionesta [Forest County]: Geol. Soc. Amer., Bull. 25, p. 215-218, illus., 1914. The pre-glacial Allegheny River and its tributaries flowed northward. When the ice was present, the flow was interrupted and ponded. Pre-Wisconsin glacial drainage was out the Tionesta River. Wisconsin drainage was diverted out the Allegheny River by an ice-dam below Warren on the Tionesta River.
15. Recent date of the attenuated glacial border in Pennsylvania: Internatl. Geol. Cong., 12th, Toronto 1913, C.R., p. 451-453, illus., Ottawa, 1914. Oxidation evidence is given to show that the glacial debris south of the [Wisconsin] moraine is not as ancient as previously thought and probably does not predate the [Wisconsin] by much.

WRIGHT, JOHN KIRTLAND

1. Douglas [Wilson] Johnson, 1878-1944: Geographic Review 34, p. 317-318, 1944.

WRIGLEY, HENRY E.

1. Special report on the petroleum of Pennsylvania: Pa. Geol. Survey 2nd, J, p. 1-78, illus., 1875. A complete outline of the petroleum industry includes

descriptions of many oil fields and the oil-bearing sands of the western counties. Little or no detail is given.

2. On the present and prospective conditions of the petroleum fields of Pennsylvania: Engineering and Mining Jour. 28, p. 70-71, illus., 1879. A generalized review of the petroleum conditions in the northwestern part of the Commonwealth is given. Speculation about reserves is included.
3. The amount of oil remaining in Pennsylvania and New York: Amer. Inst. Mining Engineers, Trans. 10, p. 354-360, illus., 1882. By calculation of known saturations and known distribution of oil-bearing rocks, 96 million barrels of oil are in the reserve.

WUTH, OTTO. See Genth, Frederick Augustus, 19.

WYCOFF, DOROTHY. See Watson, Edward Hahn, 1.

YAKLISH, JOHN P.

1. The iron ore deposit of Cornwall [Lebanon County], Pa.: Explosives Engineer 16, p. 327-333, illus., 1938. A review of the ore body is given. No new data are included. Emphasis is on the production.

YOUNG, ARTHUR E.

1. Post-glacial lakes in the Susquehanna Valley: Rocks and Minerals 21, p. 494-495, 1946. The Wilkes-Barre-Scranton lake and a lake at Great Bend are mentioned, along with other glacial-lake features in the northern part of the Commonwealth.

YOUNG, CHARLES AUGUSTUS, 1834-1908.

1. The occurrence of celestine in Blair County, Pennsylvania: Acad. Nat. Sci. Phila., Proc. [28] 1875, p. 127-128, 1875. The mineral occurs in beds of irregular thickness in a hard calcareous shale; it is fibrous.

YOUNG, WILBUR H., JR. See Torrey, Paul Dwight, 3.

YUSTER, SAMUEL TERRILL. See Bates, Robert Fulcher, 1.

ZELLER, ROBERT A., JR.

1. Central Pennsylvania's caves: Compass 25, p. 228-231, illus., 1948; Pa. State College Mineral Industry Experiment Sta., Circ. 29, p. 30-34, illus., 1948. This is a brief summary of the caves in the Ordovician rocks, along with their locations.
2. Spelunking in central Pennsylvania: Mineral Industry 17, no. 6, p. 1-4, illus., 1948. This is a popular account of caves and exploration in the Cambrian-Silurian limestones of central Pennsylvania. A map is included.
3. The structural geology and mineralization of Sinking Valley [Blair County], Pa.: M.S. thesis, Penn. State College, 1949.

ZERFOSS, SAMUEL. See Myers, William Marsh, 3.

ZERN, E. N. See Ashley, George Hall, 15.

ZIEGLER, VICTOR

1. The siliceous oolites of [Centre County] central Pennsylvania: Amer. Jour. Sci. 4th ser. 34, p. 113-127, illus., 1912. Calcareous and siliceous oolites occur in the Ordovician and Cambrian rocks. A section is measured. Several oolite zones are present. Four different kinds of oolites are recognized, based on the internal construction. Some are the result of replacement of calcite oolites in the limestones, but the majority are the result of the direct deposition of silica from hot solutions around pure quartz sand.

ZODAC, PETER

1. Hunting rock crystals near Hauto [Carbon County], Pa.: Rocks and Minerals 12, p. 71, 1937. Quartz crystals from the Pocono sandstone are described.

ANONYMOUS, I. M. 1875-1940.

1. [Earthquake at Lancaster, Lancaster County] [abs.]: Medical Repository 1, p. 572, 1798.
2. Mines and mineral resources of America, Part 4—[Pennsylvania]: Mining Mag. 1, p. 347-351, New York, 1853. A review of the occurrence of coal, lead, iron, copper, zinc, and marble in the Commonwealth is given. Few details are included.
3. Geology, *in* Report of the Chester County Medical Society: Medical Soc. Pa., Trans. ns 2, p. 113-118, illus. geol. map, 1857. [Precambrian]-[Triassic] rocks are mapped. The rocks are described but no interpretation is given. Iron and lead are the main mineral deposits.

4. Perkiomen copper mines [Montgomery County], Pennsylvania: Mining and Statistics Mag. 11, p. 73-74, 1858 [not seen, *see* Miller, B. L., Lead and zinc in Pennsylvania, 1924].
5. David Dale Owen [1807-1860]: Amer. Jour. Sci. 2nd ser. 31, p. 153-155, 1861.
6. [Geology of Lycoming County]: Medical Soc. Pa., Trans. 4th ser., Part 2, p. 88-89, 1866. A very brief description of the county is given. No details are mentioned.
7. Geology [of Snyder County]: Medical Soc. Pa., Trans. 16, p. 510-512, 1884. A cursory description of the structure and stratigraphy of the county is given. No details are included.
8. Sketch of Professor James Hall [1811-1898]: Popular Science Monthly 26, p. 120-123, 1884.
9. Isaac Lea, LL.D. [1792-1886]: Science 8, p. 556-558, port., 1886.
10. Sketch of Amos Easton [1776-1842]: Popular Science Monthly 38, p. 113-118, 1890.
11. [Borings in McDonald region, Washington County]: Amer. Geologist 12, p. 325-326, 1893. A well log is described. It includes the description of a display of the well material in a glass tube.
12. Sketch of Charles Upham Shepard [1804-1894]: Popular Science Monthly 47, p. 548-553, 1895.
13. Edward Hitchcock [1793-1864]: Popular Science Monthly 47, p. 689-696, 1895.
14. Sketch of Henry Darwin Rogers [1808-1866]: Popular Science Monthly 50, p. 258-264, 1896.
15. Sketch of Charles D[oolittle] Walcott [1850-]: Popular Science Monthly 52, p. 547-553, 1898.
16. Sketch of Charles Henry Hitchcock [1836-]: Popular Science Monthly 54, p. 260-268, 1898.
17. Ralph Dupee [!Dupuy] Lacoe [1824-1901]: Mines and Minerals 21, p. 353, 1901.
18. Angelo Heilprin [1853-1907]: Amer. Geog. Soc., Bull. 39, p. 666-668, 1907.
19. Angelo Heilprin [1853-1907]: Geog. Soc. Phila., Bull. 5, no. 4 p. 67-68, 1907.
20. William Phipps Blake [1826-1910]: Amer. Jour. Sci. 4th ser. 30, p. 95-96, 1910; Engineering and Mining Jour. 89, p. 1099, 1910.
21. W J McGee [1853-1912]: Engineering and Mining Jour. 94, p. 484, 1912; Amer. Jour. Sci. 4th ser. 34, p. 496, 1912.
22. Joseph Barrell (1869-1919): Amer. Jour. Sci. 4th ser. 48, p. 250-280, port., 1919.
23. William Bullock Clark [1860-1917]: Science ns 46, p. 104-106, 1917; Smithsonian Inst., Ann. Rpt. 1917, p. 663-666, 1919.
24. Benjamin LeRoy Miller [1874-]: Engineering and Mining Jour. Press 114, p. 1060, port., 1922.
25. James Furman Kemp [1859-]: Engineering and Mining Jour. Press 113, p. 367, port., 1922.
26. Charles D[oolittle] Walcott, President of the American Association for the Advancement of Science for the year 1923: Science ns 57, p. 120-121, 1923.
27. James Furman Kemp [1859-1926]: Canadian Mining and Metallurgical Bull. 177, p. 22-25 port., 1927.
28. Bibliography of published writings of Charles D[oolittle] Walcott [1850-1927]: Smithsonian Misc. Collections 80, no. 12, p. 23-37, 1928.
29. Barren Hill Reservoir and Allegheny River Blvd. [Allegheny County], trip 16: Field Conf. of Pa. Geologists, 4th., 2 p. (#), illus. [Pittsburgh?] [1934]. A mimeographed road log of directions to the reservoir and to the physiographic view from it are given. The Conemaugh Formation is described along the river.
30. Find *Paramphibius* tracks [Susquehanna County]: Cornell Alumni News 37, no. 28, p. 2, illus., 1935. An account and illustration of the tracks from a quarry near Susquehanna are given. They were recovered from a field trip.
31. Commercial and scientific values attached to finds of meteorites: Pa. Dept. Internal Affairs, Monthly Bull. 2, no. 2, p. 8-12, 1936. A popular account of meteorites includes some finds in the Commonwealth. A total of five are known.

32. Mount Davis [Somerset County], 3213 feet above level of sea is State's highest peak: Pa. Dept. Internal Affairs, Monthly Bull. 1, no. 5, p. 16-22, 1936. This is a popular description of the erosion of the Commonwealth with a list of the highest point in each of the counties.

33. Over 1000 gallons of water per minute discharged by 24 springs: Pa. Dept. Internal Affairs, Monthly Bull. 3, no. 1, p. 31-32, 1936. A generalized description of springs and a list of the 24 largest springs in the Commonwealth with their flow are given.

34. Pennsylvania rocks trace back over period of 1,000,000,000 years: Pa. Dept. Internal Affairs, Monthly Bull. 1, no. 6, p. 18-21, 1936. This is a popular account of the age determination of rocks. No locations are given, but presumably the Precambrian terrane is meant.

35. Potter County waters travel to Quebec, Norfolk, and New Orleans: Pa. Dept. Internal Affairs, Monthly Bull, 2, no. 3, p. 11-13, 1936. A popular account of a triple divide is given. A hill in Potter County is described.

36. Eleven kinds of building stone are to be found in Pennsylvania: Pa. Dept. Internal Affairs, Monthly Bull. 4, no. 6, p. 21-27, 1937. This is a popular account of the stone available in the Commonwealth. Use and location are discussed also.

37. First humans may have lived in Pennsylvania in glacial period: Pa. Dept. Internal Affairs, Monthly Bull. 3, no. 3, p. 25-27, 1937. A popular account of the fossil animals of glacial times in the Commonwealth is given. The possibility of human remains is considered. The bone caves are mentioned.

38. H[enry] M[artyn] Chance [1856-1937]: Mining and Metallurgical Soc. Amer., Bull. 239 [30, no. 1], p. 21-22, 1937.

39. Pennsylvania mountains formed by erosion of nearly soft rocks: Pa. Dept. Internal Affairs, Monthly Bull. 3, no. 2, p. 3-6, 1937. This is a popular description of the origin of the topography of the Commonwealth.

40. Pennsylvania rivers flowed over the mountain tops during early ages: Pa. Dept. Internal Affairs, Monthly Bull. 4, no. 3, p. 25-29, 1937. A popular account of the rejuvenation of the Schooley peneplain is given.

41. Quarry [Adams County] gives up dinosaur foot prints after millions of years: Pa. Dept. Internal Affairs, Monthly Bull. 4, no. 3, p. 12-15, 1937; addition with title, Vegetation changes cited among reasons for dinosaur extinction, no. 4, p. 8-11, illus., 1937. A popular account of a dinosaur foot print from a quarry in Triassic rocks near York Springs is given.

42. Ringing rocks [Bucks County] classified among Pennsylvania's natural oddities: Pa. Dept. Internal Affairs, Monthly Bull. 3, no. 3, p. 28-30, illus., 1937. A popular account of dense diabase which is exposed as a boulder field is given. When struck with a hammer they "ring."

43. Science plays important role in newest search for oil reserves: Pa. Dept. Internal Affairs, Monthly Bull. 3, no. 3 p. 2-12, 1937. The history of oil and gas is described briefly, with the rôle of the Commonwealth emphasized. New techniques and ideas are described, as are their application to Pennsylvania.

44. State's "thru valleys" formed as nature solved drainage problem: Pa. Dept. Internal Affairs, Monthly Bull. 4, no. 4, p. 23-28, 1937. This is a generalized description of glacial-till filled valleys in which streams run both ways.

45. Survey Bureau engaged in study of Pennsylvania mineral values: Pa. Dept. Internal Affairs, Monthly Bull. 4, no. 2, p. 12-15, 1937. A very generalized description of some of the mineral resources of the Commonwealth is given.

46. Charting of invisible sand is important part of Survey work: Pa. Dept. Internal Affairs, Monthly Bull. 6, no. 4, p. 3-7, 1938. This is a generalized, popular description of how oil sands are traced in the Commonwealth. Specific examples are used.

47. Earthquake at Beaverton [Blair County], Pa.: Earthquake Notes 10, no. 3, p. 8 (#), 1938. The third known quake in the Commonwealth occurred on July 15, 1938 at 5:45 p.m. The shock was weak (V)

48. Glacial ice changed courses of water and made Pymatuning Lake [Crawford County]: Pa. Dept. Internal Affairs, Monthly Bull. 6, no. 1, p. 13-14, 1938.

A popular account of a glacial lake formed by the glacial damming of the north-flowing Shenango River is given. The lake topped the divide and drained southward.

49. Many basic problems in geology remain for study and solution: Pa. Dept. Internal Affairs, Monthly Bull. 6, no. 3, p. 12-16, 1938. A very generalized and popular account of some of the major unsolved problems in the Commonwealth is given.

50. Pennsylvania oil found in only 1.4 per cent of state's acreage: Pa. Dept. Internal Affairs, Monthly Bull. 5, no. 3, p. 2-7, 1938. A generalized discussion of the occurrence of petroleum in the Commonwealth is given. Limiting geographic factors are considered.

51. Rich deposits and storage space for water are gifts of glaciers: Pa. Dept. Internal Affairs, Monthly Bull. 5, no. 2, p. 13-17, 1938. A very popular and generalized description of the glacial epoch in the Commonwealth is given.

52. State's largest river had many heads in its years of existence: Pa. Dept. Internal Affairs, Monthly Bull. 6, no. 2, p. 15-22, 1938. The Susquehanna River had a pre-penelain course, a peneplain course, and a rejuvenated course, all from New York. Its heads were captured by the Hudson River system. Glaciation changed its sources slightly also.

53. State's pre-historic animals would be a delight of hunters: Pa. Dept. Internal Affairs, Monthly Bull. 6, no. 3, p. 24-27, 1938. This is a popular account of the large vertebrate fossils found in the Commonwealth. They include amphibians, dinosaurs, and mastodons.

54. State has enough salt to meet world's demands for many years: Pa. Dept. Internal Affairs, Monthly Bull. 7, no. 4, p. 27-31, 1939. This is a popular account of the occurrence of salt, by county, in the western part of Pennsylvania. It occurs as rock salt and brine.

55. Survey Bureau study may upset calculations of mountains' ages: Pa. Dept. Internal Affairs, Monthly Bull. 7, no. 2, p. 13-20, 1939. A generalized, popular account of the origin of the mountains by the rejuvenation of a peneplain is given. A history of the idea is given. The age in years is not given but implied to be much less than early estimates.

56. Ticklish rock [Sullivan County], one of the State's curious formations: Pa. Dept. Internal Affairs, Monthly Bull. 7, no. 11, p. 3-4, illus., 1939. This is a popular description of a balanced rock of Pocono sandstone near Eagles Mere.

57. Wounded cow and scared poultry help locate another meteorite [Butler County]: Pa. Dept. Internal Affairs, Monthly Bull. 7, no. 3, p. 10-13, 1939. A popular account of a stony meteorite is given. No details are included. This is the first stony meteorite reported from Pennsylvania.

58. Lincoln caverns of Pennsylvania: Rocks and Minerals 15, p. 158-161, illus., 1940 [not seen].

59. Meteorite falls at [Black] Moshanon [Park, Centre County] narrowly missing boy: Pa. Dept. Internal Affairs, Monthly Bull. 9, no. 11 p. 3-5, illus., 1941. This is a popular description of a meteorite fall. No analyses or descriptions of the meteor are given.

60. Pennsylvania not in earthquake belt: Pa. Dept. Internal Affairs, Monthly Bull. 11, no. 5, p. 17-19, 1943; addition with title, More about earthquakes in Pennsylvania, by R. W. Stone, no. 8, p. 16-17, 32, 1943. This is a popular listing of the earthquakes which have been felt in the Commonwealth. Some are thought to have centered here.

61. Benjamin LeRoy Miller [1874-1944]: Pa. Sci. News-Letter 2, no 3-4, p. 7, 1944.

INDEX, by county, subject, and geologic age

ABRASIVES, *see also* individual types
- Adams Co.: Stose, G.W. 21
  - Fairfield-Gettysburg quadrangles: Stose, G.W. 27
- Cumberland Co., Fairfield quadrangle: Stose, G.W. 27
- Franklin Co., Fairfield quadrangle: Stose, G.W. 27
- Northampton Co.: Miller, B.L. 28

ACTINOLITE, *see* Amphibole

ADAMS COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, Pennsylvania-Southeastern, and Pennsylvania-Southcentral
- meteorites: Gordon, S.G. 12; Howell, E.E. 1
- popular: Stone, R.W. 48
- weathering of diabase: Frazer, P. 8

Areal geology
- Adams Co.: Stose, G.W. 21
  - Blue Ridge area: Keith, A. 1; Bascom, F. 1
  - Fairfield-Gettysburg quadrangles: Stose, G.W. 27
  - Hanover quadrangle: Stose, A.I.J. 1

Economic geology
- abrasives: Stose, G.W. 21
  - Fairfield quadrangle: Stose, G.W. 27
- asbestos: Stose, G.W. 21
- clay: Stose, G.W. 21
- copper: Bailey, J.T. 1; Blandy, J.F. 2; Frazer, P. 17, 21, 26, 33; Henderson, C.H. 1; Stose, G.W. 11, 21; Wherry, E.T. 7
  - Blue Ridge area: Bevier, G.M. 1
  - Fairfield quadrangle: Stose, G.W. 27
  - Triassic: Frazer, P. 19
- iron: Frazer, P. 20; Stose, G.W. 21
  - Blue Ridge area: Frazer, P. 13
  - Fairfield-Gettysburg quadrangles: Stose, G.W. 27
  - origin: Frazer, P. 7
  - Triassic: Frazer, P. 19
- limestone: Stose, G.W. 21
- manganese, Fairfield quadrangle: Stose, G.W. 27
- pyrophyllite: Stephenson, R.C. 1
- quartz: Stose, G.W. 21
  - Fairfield quadrangle: Stose, G.W. 27
- roofing granules: Stone, R.W. 20; Stose, G.W. 21
  - Fairfield quadrangle: Stose, G.W. 27
- sand and gravel: Stose, G.W. 21
  - Fairfield-Gettysburg quadrangles: Stose, G.W. 27
- serpentine, Fairfield quadrangle: Stose, G.W. 27
- shale: Stose, G.W. 21
- slate: Behre, C.H. 9; Stose, G.W. 21
- stone: Stose, G.W. 21
  - Fairfield-Gettysburg quadrangles: Stose, G.W. 27

Historical geology
- Cambrian: Walcott, C.D. 5
- Precambrian-Ordovician: Keith, A. 1
- Precambrian-Quaternary: Stose, G.W. 21
- Precambrian-Tertiary: Frazer, P. 13
- Precambrian-Triassic: Hickock, W.O. 8
  - Fairfield-Gettysburg quadrangles: Stose, G.W. 27
  - Hanover quadrangle: Stose, A.I.J. 1
- Triassic: Keith, A. 1
  - faulting: Stose, G.W. 47

Maps
- Economic
  - copper, Blue Ridge area: Bevier, G.M. 1
  - Fairfield-Gettysburg quadrangles, mineral resources: Stose, G.W. 27
  - iron: Frazer, P. 13, 20
  - limestone: Swain, F.M. 2
- Geologic: Frazer, P. 9; Lesley, J.P. 46, 47; Stose, G.W. 21
  - Blue Ridge copper district: Wherry, E.T. 7
  - Fairfield-Gettysburg quadrangles: Stose, G.W. 27
  - Hanover quadrangle: Stose, A.I.J. 1
  - Triassic diabase: Stose, G.W. 15
- Structure, Fairfield-Gettysburg quadrangles: Stose, G.W. 27

Mineralogy
- glauberite: Stose, G.W. 17
- malachite: Eyerman, J. 1
- piedmontite: Stose, G.W. 21
- tenorite (melaconite): Eyerman, J. 1

Paleontology
- dinosaur, Triassic, popular: Anon. 41

Petrology
- aporhyolite, Blue Ridge area: Bascom, F. 2, 5
- basalt: Williams, G.H. 2
- breccia: Williams, G.H. 2
- diabase: Frazer, P. 3, 5; Stose, G.W. 15
- limestone analyses: Frazer, P. 10
- rhyolite: Williams, G.H. 2
- tuff: Williams, G.H. 2
- volcanic rocks, Blue Ridge area: Bascom, F. 4

Physical geology
faults, Blue Ridge area: Stose, G.W. 13
Triassic: Stose, G.W. 47
folding, Blue Ridge area: Cloos, E. 6
Physiography
exfoliation, "Devils Den": Frazer, P. 2
glacial striae: Frazer, P. 14
peneplains: Keith, A. 1

ALBITE, *see* Feldspar

ALGAE, *see also* Paleobotany
Berks-Bucks Cos.: Fenton, C.L. 1
Centre-Northampton Cos.: Fenton, C.L. 1
Lancaster Co., Cambrian: Resser, C.E. 3
Ordovician: Frazer, P. 35
York Co., Ordovician: Frazer, P. 35
Triassic: Wanner, A. 1

ALLANITE, *see also* Radioactive minerals
Berks Co.: Genth, F.A. 7; Smith, S. 1
Chester Co.: Lea, I. 16; Rammelsburg, C.F. 1; Wherry, E.T. 2
Delaware Co.: Wherry, E.T. 2
Lehigh Co.: Blake, W.P. 4
Northampton Co.: Genth, F.A. 7
Philadelphia Co.: Wherry, E.T. 2
Southeastern: Stone, R.W. 47
weathering products: Watson, E.H. 3

ALLEGHENY COUNTY, *see also* Pennsylvania, Pennsylvania-Southwestern, and Pennsylvania-Western
deep-well temperatures: Watson, T.L. 1
meteorites: Cohen, E.W. 1; Leighton, H. 11; Silliman, B. Jr. 7
popular: Stone, R.W. 58
Areal geology
Allegheny Co.: D'Invilliers, E.V. 9; Jillson, B.C. 1; Stevenson, J.J. 4
Beaver quadrangle: Woolsey, L.H. 3
Brownsville quadrangle: Campbell, M.R. 2
Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
Freeport quadrangle: Hughes, H.H. 1
McConnell Mills area: Cooley, R. 1
New Kensington quadrangle: Richardson, G.B. 9
northern: White, I.C. 6
Pittsburgh area: Grant, U.S. 1; Leighton, H. 8; Lesley, J.P. 56; Raymond, P.E. 7; White, I.C. 22
popular: Leighton, H. 3
Pittsburgh quadrangle: Johnson, M.E. 9
Sewickley quadrangle: Munn, M.J. 5
southern: Stevenson, J.J. 3
Economic geology
clay: Leighton, H. 5
Beaver quadrangle: Woolsey, L.H. 3, 4
Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
Freeport quadrangle: Hughes, H.H. 1
Pittsburgh quadrangle: Johnson, M.E. 9
Sewickley quadrangle: Munn, M.J. 5
coal, bituminous: Billings, M.H. 1; Lesley, J.P. 56; Rayburn, J.M. 1; Sisler, J.D. 1, 27; Stevenson, J.J. 4; Wall, J.S. 1
Beaver quadrangle: Woolsey, L.H. 3, 4
Brownsville quadrangle: Campbell, M.R. 2
Burgettstown quadrangle: Griswold, W.T. 1; Shaw, E.W. 3
Carnegie quadrangle: Shaw, E.W. 3
Freeport quadrangle: Hughes, H.H. 1
New Kensington quadrangle: Richardson, G.B. 9
northern: White, I.C. 6
Pittsburgh bed: D'Invilliers, E.V. 6
Pittsburgh quadrangle: Johnson, M.E. 9
popular: Leighton, H. 3
reserves: Reese, J.F. 2
Sewickley quadrangle: Munn, M.J. 5
gravel: Shaw, E.W. 1
Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
iron: Stevenson, J.J. 4
Freeport quadrangle: Hughes, H.H. 1
limestone
Beaver quadrangle: Woolsey, L.H. 3, 4
Brownsvile quadrangle: Campbell, M.R. 2
Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
Freeport quadrangle: Hughes, H.H. 1
Pittsburgh quadrangle: Johnson, M.E. 9
Sewickley quadrangle: Munn, M.J. 5
marl: Dickey, F.B.R. 1
mineral resources: Aigster, F. 1
natural gas: Ashley, G.H. 21; Ingham, A.I. 2; Robinson, J.F. 1
Beaver quadrangle: Woolsey, L.H. 3, 4
Boyds Hill well: Lesley, J.P. 27
Brownsville quadrangle: Campbell, M.R. 2
Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
Freeport quadrangle: Hughes, H.H. 1
McKeesport area: Ashley, G.H. 13

    New Kensington quadrangle: Richardson, G.B. 9
    Pittsburgh quadrangle: Johnson, M.E. 4, 9
    popular: Leighton, H. 3
    Sewickley quadrangle: Munn, M.J. 5
  petroleum: Cummins, A. 1; Ingham, A.I. 2
    Beaver quadrangle: Woolsey, L.H. 3, 4
    Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
    Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
    Freeport quadrangle: Hughes, H.H. 1
    McDonald oil field: Ingham, A.I. 3
    New Kensington quadrangle: Richardson, G. B. 9
    Pittsburgh quadrangle: Johnson, M.E. 4, 6, 9
    popular: Leighton, H. 3
    Sewickley quadrangle: Munn, M.J. 2, 4, 5
  sand: Shaw, E.W. 1
    Beaver quadrangle: Woolsey, L.H. 4
    Brownsville quadrangle: Campbell, M.R. 2
    Sewickley quadrangle: Munn, M.J. 5
  sand and gravel
    Freeport quadrangle: Hughes, H.H. 1
    Pittsburgh quadrangle: Johnson, M. E. 9
  sandstone
    Beaver quadrangle: Woolsey, L.H. 3, 4
    Freeport quadrangle: Hughes, H.H. 1
    Pittsburgh quadrangle: Johnson, M. E. 9
  shale: Leighton, H. 5
    Beaver quadrangle: Woolsey, L.H. 3, 4
    Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
    Pittsburgh quadrangle: Johnson, M.E. 9
  stone
    Brownsville quadrangle: Campbell, M.R. 2
    Sewickley quadrangle: Munn, M.J. 5
Ground water
  Allegheny Co.: Piper, A.M. 1
    popular: Adamson, J.H. 2
  Pittsburgh area: Hull, T.E. 1
    popular: Adamson, J.H. 4
  Pittsburgh quadrangle: Johnson, M.E. 9
  springs, mineral: Meade, W. 2
  valley-fill deposits: Adamson, J.H. 3
Historical geology
  Devonian
    McDonald oil field: Ingham, A.I. 3
    Sewickley quadrangle: Munn, M.J. 4
  Devonian-Mississippian, Freeport quadrangle: Hughes, H.H. 1
  Devonian-Pennsylvanian: Ingham, A.I. 2; White, I.C. 20
    Beaver quadrangle: Woolsey, L.H. 4
    Pittsburgh area: Lesley, J.P. 27
    Pittsburgh quadrangle, oil sands: Johnson, M.E. 6
    Sewickley quadrangle: Munn, M.J. 5
  Devonian-Permian: Munn, M.J. 6
    Burgettstown quadrangle: Griswold, W.T. 2
  Devonian-Pleistocene, Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
  Mississippian-Pleistocene, Brownsville quadrangle: Campbell, M.R. 2
  Pennsylvanian: Darrah, W.C. 2; D'Invilliers, E.V. 6; Graban, A.W. 2; Jillson, B.C. 1; Lesley, J.P. 56; Myers, C.K. 1; Newmyer, A.J. 1; Raymond, P.E. 1; Stevenson, J.J. 4, 5
    Beaver quadrangle: Woolsey, L.H. 3
    Conemaugh Formation: Anon. 29
    New Kensington quadrangle: Richardson, G.B. 9
    northern: White, I.C. 6
    Pittsburgh area: Leighton, H. 8
    Pittsburgh quadrangle: Johnson, M.E. 9
    popular: Leighton, H. 3
    southern: Stevenson, J.J. 3
    Upper Freeport coal: Rayburn, J.M. 1
  Pleistocene: Adamson, J.H. 3
    peat: Schopf, J.M. 1
Maps
  Economic
    Beaver quadrangle, mineral resources: Woolsey, L.H. 3, 4
    Brownsville quadrangle, mineral resources: Campbell, M.R. 2
    Burgettstown-Carnegie quadrangles, mineral resources: Shaw, E.W. 3
    coal, bituminous: Wall, J.S. 1
    ground-water, valley-fill deposits: Adamson, J.H. 3
    petroleum: Ingham, A.I. 2
      Sewickley quadrangle: Munn, M.J. 4
    petroleum and gas
      Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
      Carnegie quadrangle: Munn, M.J. 6; Shaw E.W. 3
      Freeport quadrangle: Hughes, H.H. 1
      Pittsburgh quadrangle: Johnson, M.E. 9
    Sewickley quadrangle: Munn, M.J. 5

- Pittsburgh quadrangle, mineral resources: Johnson, M.E. 9
- Sewickley quadrangle, mineral resources: Munn, M.J. 5

Geologic: D'Invilliers, E.V. 9; Jillson, B.C. 1; Lesley, J.P. 46, 47; Stevenson, J.J. 4, 5
- Beaver quadrangle: Woolsey, L.H. 3
- Brownsville quadrangle: Campbell, M.R. 2
- Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
- Freeport quadrangle: Hughes, H.H. 1
- northern: White, I.C. 6
- Pittsburgh quadrangle: Johnson, M.E. 9
- Sewickley quadrangle: Munn, M.J. 5

Isopach, Gordon sand, Devonian: Ingham, A.I. 3

Structure
- Beaver quadrangle: Woolsey, L.H. 3
- Brownsville quadrangle: Campbell, M.R. 2

Structure Contour
- Beaver quadrangle
  - Pittsburgh coal: Woolsey, L.H. 4
  - Upper Freeport coal: Woolsey, L.H. 3
- Brownsville quadrangle, Pittsburgh coal: Campbell, M.R. 2
- Burgettstown quadrangle, Pittsburgh coal: Griswold, W.T. 1, 2; Shaw, E.W. 3
- Carnegie quadrangle
  - Gordon sand, Devonian: Munn, M.J. 6
  - Pittsburgh coal: Shaw, E.W. 3
- Fifth sand, Devonian: Ingham, A.I. 2
- Freeport quadrangle, Upper Freeport coal: Hughes, H.H. 1
- Gordon sand, Devonian: Ingham, A.I. 2
- Greensburg quadrangle, Pittsburgh coal: Johnson, M.E. 1
- Hopper field, Fourth sand, Devonian: Ingham, A.I. 2
- McDonald oil field: Ingham, A.I. 3
- McKeesport area, Pittsburgh coal: Ashley, G.H. 21
- Mississippian sands: Ingham, A.I. 2
- Moon Run-Crafton fields, Fourth sand, Devonian: Ingham, A.I. 2
- Pennsylvanian sands: Ingham, A.I. 2
- Pittsburgh coal: D'Invilliers, E.V. 6; Ingham, A.I. 2
- Pittsburgh quadrangle, Pittsburgh coal: Johnson, M.E. 4, 9
- Sewickley quadrangle
  - Ames limestone, Pennsylvanian: Munn, M.J. 4, 5
  - Hundred-foot sand, Devonian: Munn, M.J. 4, 5
- Venice field, Fourth sand, Devonian: Ingham, A.I. 2

Paleontology
- amphibians, Pennsylvanian: Case, E.C. 1; Darrah, W.C. 1; Moodie, R.L. 3; Raymond, P.E. 2; Romer, A.S. 2
- crinoid, Pennsylvanian, Ames limestone: Burke, J.J. 1
- elephant, Pleistocene: Leidy, J. 9
- insects: Pennsylvanian: Carpenter, F.M. 1
- Pennsylvanian fauna: Seaman, D.M. 1
  - Ames limestone: Theiss, M.E. 1
  - popular: Leighton, H. 3
- plants, Pennsylvanian: Darrah, W.C. 1; Gresley, W.S. 2; Grier, N.M. 1, 2
  - popular: Leighton, H. 3
- reptiles, Pennsylvanian: Case, E.C. 1; Moore, W.D. 1; Raymond, P.E. 2

Petrology
- Morgantown sandstone: Johnson, W.S. 1
- Pittsburgh quadrangle, oil sands: Johnson, M.E. 6

Physical geology
- Amity anticline: Robinson, J.F. 1
- Murrysville anticline, McKeesport area: Ashley, G. H. 13
- structure: D'Invilliers, E.V. 6; Ross, R.B. 1; Sisler, J.D. 1; Stevenson, J.J. 4
  - Greensburg quadrangle: Johnson, M.E. 1
  - northern: White, I.C. 6
  - Pittsburgh quadrangle. Johnson, M.E. 4

Physiography
- Allegheny Co.; Anon. 29
- Beaver quadrangle: Woolsey, L.H. 3
- erratics: Gresley, W.S. 5
- glacial geology: Grant, U. S. 1
- glacial gravel: Shaw, E.W. 1
- glacial lakes: Jillson, B.C. 1
- terraces
  - Beaver River: Wright, G.F. 8
  - Pleistocene: Stevenson, J.J. 3

ALLITE
- Chester-Lancaster Cos.: Silliman, B. Jr. 4

ALLOPHANE
- Lehigh Co.: Smith, E.F. 2

ALLUVIAL FANS
- Berks Co., Triassic: McLaughlin, D.B. 3

- **ALUMINUM**, *see also* aluminum-bearing minerals
  - Clearfield Co., popular: Foose, R.M. 10
  - Pennsylvania: Ashley, G.H. 76
- **ALUNOGEN**
  - Schuylkill Co.: Reinhold, E.S. 2
- **AMETHYST**, *see* Quartz
- **AMMONOIDEA**, *see* Cephalopoda
- **AMPHIBIA**
  - Allegheny Co., Pennsylvanian: Case, E.C. 1; Darrah, W.C. 1; Moodie, R.L. 3; Raymond, P.E. 2; Romer, A.S. 2
  - Beaver Co., Pennsylvanian: Cope, E.D. 12; Moodie, R.L. 3
  - Blair Co., Quaternary: Peterson, O.A. 1
  - Bucks Co., Triassic: Ryan, J.D. 1
  - Chester Co., Triassic: Heune, F. von 1
  - Dauphin Co., Pennsylvanian: Leidy, J. 8
  - Montgomery Co., Pleistocene: Wheatley, C.M. 2
  - Northwestern, Devonian: Caster, K.E. 1
  - Pennsylvania, Pennsylvanian: Moodie, R.L. 1, 2
  - Schuylkill Co., Pennsylvanian: Leidy, J. 12
  - Southwestern, Permian: Burke, J.J. 2
  - Susquehanna Co., Devonian: Anon. 30; Willard, B. 22
  - Warren Co., Devonian: Marsh, O.C. 1
  - Westmoreland Co., Pennsylvanian: King, A.T. 3
- **AMPHIBOLE**
  - actinolite
    - (byssolite), Chester Co.: Vaux, G. 2
    - Delaware Co.: Seybert, A. 5; Thomson, T. 2
    - Philadelphia Co.: Carpenter, G.W. 1
  - antholite, Delaware Co.: Leeds, A.R. 7
  - anthophyllite
    - Chester Co.: Genth, F.A. 14; Vaux, G. 2
    - Lancaster Co.: Genth, F.A. 14
  - asbefferite, Chester Co.: Goldsmith, E. 1
  - glaucophane, Berks Co.: Bliss, E.F. 1
  - hornblende, Delaware Co.: Sharples, S.P. 1
  - Northampton Co.: Eyerman, J. 6
  - reibeckite (crocidolite), Southeastern: Wherry, E.T. 27
- **ANALYSES**
  - allanite, Southeastern, weathering products: Watson, T.L. 3
  - chromite, Southeastern: Corbin, J.R. 4
  - clay
    - Beaver Co.: McCreath, A.S. 2; Woolsey, L.H. 1
    - Central: Sanford, R.S. 1
    - Fayette Co.: Leighton, H. 9
    - Pennsylvania: McCreath, A.S. 3
    - Southwestern: Leighton, H. 5
  - coal
    - Pennsylvania: Campbell, M.R. 12; Land, N.W. 1
    - anthracite
      - Dauphin Co.: Johnson, W.R. 7
      - Luzerne Co.: Johnson, W.R. 1, 3
      - Northampton Co.: Johnson, W.R. 1
      - Northeastern: Ashley, G. H. 20; Campbell, M.R. 13; McCreath, A.S. 3; Johnson, W.R. 5; Rogers, H.D. 5
      - Schuylkill Co.: Johnson, W.R. 1
      - Sullivan Co., Bernice basin: Ashburner, C.A. 32
  - bituminous
    - Allegheny Co.
      - Freeport quadrangle: Hughes, H.H 1
      - Pittsburgh coal: Fieldner, A.C. 5
    - Armstrong Co.
      - Freeport quadrangle: Hughes, H.H. 1
      - Kittanning quadrangle: Butts, C. 3
    - Beaver Co.: McCreath, A.S. 2
    - Bedford Co.: Gardner, J.H. 1
    - Blair Co., Mississippian: Ashburner, C.A. 34
    - Bradford Co.: Johnson, W.R. 4
    - Butler Co.; McCreath, A.S. 2
      - Kittanning quadrangle: Butts, C. 3
    - Cambria Co.: Clemson, T.G. 2; Phalen, W.C. 2
      - Lower Kittanning coal: Fieldner, A.C. 6
      - Upper Kittanning coal: Fieldner, A.C. 6
    - Centre Co.: Platt, F. 14
    - Clarion Co., Kittanning quadrangle: Butts, C. 3
    - Clearfield Co., Punxsutawney quadrangle: Ashley, G.H. 33
    - Clinton Co.: Platt, F. 13, 14
    - Elk Co.: Jackson, C.T. 1
    - Fayette Co.: Hickok, W.O. 10
    - Fulton Co.: Gardner, J.H. 1
    - Greene Co.: Boileau, J.W. 1
    - Huntingdon Co.: Gardner, J.H. 1
    - Indiana Co., Punxsutawney quadrangle; Ashley, G.H. 33
    - Jefferson Co., Punxsutawney quadrangle: Ashley, G.H. 33
    - Lycoming Co.: Hodge, J.T. 2
    - Somerset Co.: Campbell, M.R. 10; Phalen, W.C. 2; Sisler, J.D. 17, 19; U.S.G.S. 1
      - northern: Sisler, J.D. 18

  Southampton Twp.: Johnson, W.R. 12
  Southwestern: Stone, R.W. 10
  Sullivan Co.: Platt, F. 7; U.S.G.S. 1
  Tioga Co.: Clemson, T.G. 3; Meade, W. 3
  Washington Co.: Boileau, J.W. 1; U.S.G.S. 1
  Western: Ashley, G.H. 20; Campbell, M.R. 9, 13; Cooper, H.M. 1; Fieldner, A.C. 1, 2; Johnson, W.R. 5; McCreath, A.S. 1, 3, 5; Owen, D.D. 1; Snyder, H.N. 1; White, C.D. 5
  Westmoreland Co.: Phalen, W.C. 2
    Freeport quadrangle: Hughes, H.H. 1
  cannel, Western: Ashley, G.H. 11, 12
  splint, Pennsylvania: Sprunk, G.C. 1
copper ore, Adams Co.: Frazer, P. 17
dolomite
  Lehigh-Northampton Cos.: Salisbury, S.H. 1
  Southeastern: Weitz, J.H. 1
fire clay
  Clinton Co.: Platt, F. 13
  Fayette Co.: Leighton, H. 9
  Pennsylvania: McCreath, A.S. 1, 5
ganister, Blair Co.: Butts, C. 10
ground water
  Northcentral: Lohman, S. W. 3
  Northwestern: Leggette, R.M. 1
  Southwestern: Piper, A.M. 1
  Pennsylvania, bibliography: Collins, W.D. 1
iron ore
  Blair Co.: Genth, F.A. 10
  Bradford Co.: Johnson, W.R. 4
  Butler Co.: McCreath, A.S. 2
  Cambria Co.: Clemson, T.G. 2
  Centre Co.: Genth, F.A. 10, 19; Lesley, J.P. 20
  Cumberland Valley: D'Invilliers, E.V. 7
  Huntingdon Co.: Genth, F.A. 10; Lesley, J.P. 20
  Lycoming Co.: Hodge, J.T. 2
  Pennsylvania: Hickok, W.O. 9; McCreath, A.S. 1, 3, 5; Putnam, B.T. 1; Rogers, H.D. 4
  Schuylkill Co.: Johnson, W.R. 1
  Somerset Co., Southampton Twp.: Johnson, W.R. 12
  Southeastern: Rogers, H.D. 5
  Tioga Co.: Clemson, T.G. 3
lead ore, Blair-Fayette Cos.: McCreath, A.S. 3
limestone
  Adams Co.: Frazer, P. 10
  Beaver-Butler Cos.: McCreath, A.S. 2
  Blair-Huntingdon Cos.: Genth, F.A. 10
  Bradford Co.: Johnson, W.R. 4
  Centre Co.: Genth, F.A. 10, 19
  Lawrence Co.: Peck, F.B. 10
  Lehigh Co.: Miller, B.L. 44; Peck, F.B. 8
  Northampton Co.: Peck, F.B. 8
  Pennsylvania: Frear, W. 2; McCreath, A.S. 1, 3, 5; Miller, B.L. 20
  Somerset Co., Southampton Twp.: Johnson, W.R. 12
  Southeastern: Rogers, H.D. 5
  Southwestern: Clapp, F.G. 1
  York Co.: Frazer, P. 10; Jandorf, M.L. 1
limonite
  Lehigh Co.: Miller, B.L. 44
  Pennsylvania: Corbin, J.R. 3
magnetite
  Lebanon Co., Cornwall area: Cumings, W.L. 1; D'Invilliers, E.V. 7
  Southeastern: Spencer, A.C. 2
minerals
  Bucks-Montgomery-Philadelphia Cos.: Hall, C.E. 7
  Delaware Co.: Genth, F.A. 20
  Pennsylvania: Genth, F.A. 11, 12
natural gas, Western: Carll, J.F. 7; Hickok, W.O. 3; Phillips, F.C. 1
oil shale, Western: Ashley, G.H. 11
petroleum, Western: Hickok, W.O. 3
philadelphite (vermiculite), Philadelphia Co.: Lewis, H.C 11
rocks
  Bucks-Montgomery-Philadelphia Cos.: Hall, C.E. 7
  Delaware Co.: Genth, F.A. 20
serpentine, Northampton Co.: Peck, F.B. 8
shale
  Franklin Co.: Frazer, P. 18
  Southwestern: Leighton, H. 5
  Western: Emery, A.H. 1
slate, Southeastern: Bates, T.F. 3
springs, Pennsylvania: Peale, A.C. 1
talc, Northampton Co.: Peck, F.B. 8
water, connate, Western: Barb, C.F. 2; Fettke, C.R. 19
zinc ore, Blair Co.: McCreath, A.S. 3

ANALCITE, *see* Zeolites

ANDALUSITE
Delaware Co.: Dana, E.S. 1

ANDESITE, *see also* Igneous rocks
Berks-Lehigh-Northampton Cos., Reading Prong: Fraser, D.M. 7

ANDRADITE, *see* Garnet

ANGLESITE, *see also* Lead
Chester Co.: Lang, V. 1; Smith, J.L. 1; Thomas, C.A. 8
Montgomery Co.: Lang, V. 1

ANHYDRITE
- Chester-Delaware Cos.: Koenig, G.A. 7

ANKERITE, *see* Dolomite

ANTHOZOA, *see* Coeleuterata

ANTHOLITE, *see* Amphibole

ANTHOPHYLLITE, *see* Amphibole

ANTICLINES
- Allegheny Co.: Ashley, G.H. 13; Sisler, J.D. 1; Stevenson, J.J. 4
  - Amity anticline: Robinson, J.F. 1
  - Greensburg quadrangle: Johnson, M.E. 1
  - northern: White, I.C. 6
  - Pittsburgh quadrangle: Johnson, M.E. 4
  - relation to petroleum: Munn, M.J. 2
- Armstrong Co.: Sisler, J.D. 2
- Beaver Co.: White, I.C. 6
- Bedford Co.: Stevenson, J.J. 8
- Blair Co.: Platt, F. 15
- Butler Co.: Sisler, J.D. 4
  - northern: Chauce, H.M. 4
  - southern: White, I.C. 6
- Cambria Co.: Sisler, J.D. 5
  - Barnesboro-Patton quadrangles: Ashley, G.H. 10
  - Laurel Hill anticline: Platt, F. 4
- Cameron Co.: Cathcart, S.H. 10
- Carbon Co.
  - Lehigh River: Winslow, A. 2
  - Panther Creek coal basin: Ashburner, C.A. 2
- Centre Co.: D'Invilliers, E.V. 4
  - Houtzdale quadrangle: Ashley, G.H. 10
- Chester Co.
  - fork-tongued: Lesley, J.P. 5
  - Mine Ridge: Stose, G.W. 37
  - Woodville anticline, recumbent: Bailey, E.B. 1
- Clarion Co.: Chance, H.M. 6; Sisler, J.D. 7
- Clearfield Co., Barnesboro-Patton-Houtzdale-Punxsutawney quadrangles: Ashley, G.H. 10
- Clinton Co.: Chance, H.M. 7
- Elk Co.: Cathcart, S.H. 9
- Fayette Co.: Sisler, J.D. 9
  - Pittsburgh coal: D'Invilliers, E.V. 6
  - western: Stevenson, J.J. 4
- Fulton Co.: Stevenson, J.J. 8
- Greene Co.: Sisler, J.D. 11
  - Washington anticline: Clapp, F.G. 12
- Indiana Co.: Sisler, J.D. 10
  - Barnesboro-Punxsutawney quadrangles: Ashley, G.H. 10
  - Indiana anticline: Richardson, G.B. 1
- Jefferson Co.: Platt, W.G. 3; Sisler, J.D. 12
  - Punxsutawney quadrangle: Ashley, G.H. 10
- Lancaster Co.
  - Barren Hills: Stose, G.W. 37
  - Chiques Rock: Frazer, P. 26
  - Martic anticline: Frazer, P. 24
  - Mine Ridge: Stose, G.W. 37
  - Welsh Mountain: Stose, G.W. 37
- Luzerne Co.
  - Lehigh River: Wiuslow, A. 2
  - Wyoming Valey: Ashburner, C.A. 36
- Lycoming Co.: Sherwood, A. 2
- McKean Co.: Cathcart, S.H. 8
- Northeastern: Ashley, G.H. 49
- Northern: Cathcart, S.H. 7
- Pennsylvania, relation to the mountains: Chittendon, A.P. 1
- Perry Co., New Bloomfield quadrangle: Cleaves, A.B. 2
- Potter Co.: Cathcart, S.H. 5; Sherwood, A. 3
  - Hebron anticline: Platt, F. 10
- Schuylkill Co., Panther Creek coal basin: Ashburner, C.A. 2
- Somerset Co.
  - northern: Sisler, J.D. 18
  - southern: Sisler, J.D. 19
  - Viaduct anticline: Platt, F. 4
- Sullivan Co.: Platt, F. 9
- Tioga Co.: Cathcart, S.H. 6
- Washington Co.: Sisler, J.D. 15; Stevenson, J.J. 3
  - Pittsburgh coal: D'Invilliers, E.V. 6
- Western: Grow, G.C. 1
- Westmoreland Co.: Sisler, J.D. 16
  - Bellevernon anticline: Robinson, J.F. 2
  - Greensburg quadrangle: Johnson, M.E. 1
  - Pittsburgh coal: D'Invilliers, E.V. 6
  - western: Stevenson, J.J. 4

APATITE
- Chester Co.: Seybert, H. 1; Wherry, E.T. 23
  - (moroxite), Bucks Co.: Morton, S.G. 1
- Philadelphia Co.: Carpenter, G.W. 1; Gordon, S. 1

APOPHYLLITE
- Berks Co.: Sadtler, B. 1; Smith, E.F. 4; Thomas, C.A. 5
- Chester Co.: Eyerman, J. 1, 2; Kuerr, E.B. 1; Thomas, C.A. 9

APORHYOLITE
- Adams-Franklin Cos.: Bascom, F. 5
  - Blue Ridge area: Bascom, F. 2
- Cumberland Co., Blue Ridge area: Bascom, F. 2

APPALACHIA
- gravity delineation, Eastern: Thom, W.T. 1
- topography: Nelson, W.A. 1

APPALACHIAN MOUNTAINS
- origin: Billings, M.P. 1
- original height: Chamberlin, R.T. 1; Lesley, J.P. 24; Longwell, C.R. 1
- physiographic divisions: Guyot, A. 1
- popular: Ashley, G.H. 74
- structural formation: Keith, A. 5
- structural anticlines: Keith, A. 3
- structure: Rogers, W. B. 2
  - history: Rodgers, J. 1

AQUACREPTITE
- Chester Co.: Shepard, C.U. 4
- Philadelphia Co.: Parker, G.H. 1
- Southeastern: Lewis, H.C. 22

ARAGONITE
- Armstrong Co.: Hamilton, H.V. 1
- Berks Co.: Genth, F. A. 21
- Lehigh Co.: Faux, F.R. 1
- Northampton Co.: Eyerman, J. 1

ARGENTINE, *see* Calcite

ARMSTRONG COUNTY, *see also* Pennsylvania, Pennsylvania-Western

Areal geology
- Armstrong Co.: Platt, W.G. 2
- Brookville quadrangle: Graeber, C.K. 3
- Clarion quadrangle: Shaw, E.W. 4
- Elders Ridge quadrangle: Stone, R.W. 3
- Freeport quadrangle: Hughes, H.H. 1
- Kittanning quadrangle: Butts, C. 3
- Rural Valley quadrangle: Butts, C. 5
- Smicksburg quadrangle: Shaffner, M.N. 2, 3

Economic geology
- clay: Leighton, H. 5
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
  - Smicksburg quadrangle: Shaffner, M.N. 3
- coal, bituminous: Platt, W.G. 2; Sisler, J.D. 2, 27; Stone, R.W. 2
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Foxburg quadrangle: Shaw, E.W. 2
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C. 3, 6
  - reserves: Reese, J.F. 3
  - Rural Valley quadrangle: Butts, C. 5, 6
  - Smicksburg quadrangle: Shaffner, M.N. 3
- coal, cannel: Ashley, G.H. 1
- fire clay: Platt, W.G. 2
- gravel: Shaw, E.W. 1
- iron
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Shaw, E.W. 4
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
- limestone: Platt, W.G. 2
  - Clarion quadrangle: Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
  - Smicksburg quadrangle: Shaffner, M.N. 3
- natural gas
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Foxburg quadrangle: Shaw, E.W. 2
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C, 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
  - Smicksburg quadrangle: Shaffner, M.N. 3
- petroleum
  - Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3
  - Foxburg quadrangle: Shaw, E.W. 2
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
- salt: Platt, W.G. 2
- sand, Kittanning quadrangle: Butts, C. 3
- sand and gravel, Freeport quadrangle: Hughes, H.H. 1

- sandstone: Platt, W.G. 2
  - Clarion quadrangle: Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3
  - Freeport quadrangle: Hughes, H.H. 1
  - Smicksburg quadrangle: Shaffner, M.N. 3
- shale: Leighton, H. 5
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 5
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 6
- stone
  - Kittanning quadrangle: Butts, C, 3, 6
  - Rural Valley quadrangle: Butts, C. 6

Ground water

- Armstrong Co.: Leggette, R.M. 1
- Brookville quadrangle: Graeber, C.K. 3
- Elders Ridge quadrangle: Stone, R.W. 6
- Smicksburg quadrangle: Shaffner, M.N. 3

Historical geology

- Devonian: White, I.C. 25
- Devonian-Mississippian: Lucas, D.J. 1
  - Freeport quadrangle: Hughes, H.H. 1
- Devonian-Pennsylvanian: Lesley, J.P. 11
  - Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Foxburg quadrangle: Shaw, E.W. 2
  - Kittanning quadrangle: Butts, C. 2
- Mississippian, Pocono Formation: Campbell, M.R. 4
- Mississippian-Pennsylvanian
  - Brookville quadrangle: Graeber, C.K. 3
  - Smicksburg quadrangle: Shaffner, M.N. 2, 3
- Mississippian-Pleistocene, Rural Valley quadrangle: Butts, C. 5
- Pennsylvanian: Platt, W.G. 2
  - stream courses: Blandy, J.F. 1

Maps

- Economic
  - Brookville quadrangle, mineral resources: Graeber, C.K. 3
  - Clarion quadrangle, mineral resources: Shaw, E.W. 4
  - coal, bituminous, Foxburg quadrangle: Shaw, E.W. 2
  - Elders Ridge quadrangle, mineral resources: Stone, R.W. 3, 5
  - Kittanning quadrangle, mineral resources: Butts, C. 3, 6
  - petroleum: Carll, J.F. 3; Lesley, J.P. 51
    - Clarion quadrangle: Munn, M.J. 3
  - petroleum and gas
    - Clarion quadrangle: Shaw, E.W. 4
    - Foxburg quadrangle: Shaw, E.W. 2
    - Freeport quadrangle: Hughes, H.H. 1
  - Rural Valley quadrangle, mineral resources: Butts, C. 5, 6
  - Smicksburg quadrangle, mineral resources: Shaffner, M.N. 3
- Geologic: Lesley, J. P. 46, 47; Platt, W.G. 2
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3
  - Foxburg quadrangle: Shaw, E.W. 2
    - Vanport limestone, Pennsylvanian: Shaw, E.W. 2
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
  - Smicksburg quadrangle: Shaffner, M.N. 2, 3
- Structure contour
  - Brookville quadrangle, Catskill sandstone, Devonian: Graeber, C.K. 3
  - Clarion quadrangle
    - Lower Kittanning coal: Munn, M.J. 3
    - Vanport limestone, Pennsylvanian: Shaw, E.W. 4
  - Elders Ridge quadrangle, Upper Freeport coal: Stone, R.W. 3, 5
  - Freeport quadrangle, Upper Freeport coal: Hughes, H.H. 1
  - Kittanning quadrangle, Vanport limestone, Pennsylvanian: Butts, C. 3, 6
  - Rural Valley quadrangle, Vanport limestone, Pennsylvanian: Butts, C. 5, 6
  - Smicksburg quadrangle, Shaffner, M.N. 2, 3

Mineralogy

- aragonite-barite: Hamilton, H.V. 1
- calcite-galena: Hamilton, H.V. 1
- goethite-marcasite: Hamilton, H.V. 1
- pyrite-quartz: Hamilton, H.V. 1
- siderite: Hamilton, H.V. 1

Physical geology

- structure: Sisler, J.D. 2
- Clarion quadrangle: Munn, M.J. 3

Physiography

- drainage change, Allegheny River: Lesley, J.P. 31

glacial gravel: Leverett, F. 2; Shaw, E.W. 1

ARTHROPODA, *see also* Crustacea, Trilobita, Insecta, Eurypterida, and Ostracoda
  Northwestern, Devonian: Caster, K.E. 1
  phyllocarids, Warren Co., Devonian: Beecher, C.E. 6
  phyllopods, Warren Co., Devonian: Beecher, C.E. 1

ASBEFFERITE, *see* Dannemorite

ASBESTOS, *see also* individual asbestos minerals
  Adams Co.: Stose, G.W. 21
  Bucks-Northampton Cos., Delaware water gap-Easton quadrangles: Bayley, W.S. 2
  Delaware Co.: Rand, T.D. 14; Willcox, J. 2
  Pennsylvania: Stone, R.W. 39

ASBOLITE
  Montgomery Co.: Lewis, H.C. 3

ASH, *see also* Bentonite
  Pennsylvania, Ordovician: Kay, G.M. 1

AUGITE, *see* Pyroxene

AURICHALCITE
  (buratite), Lancaster Co.: Taylor, W.J. 1

AUTUNITE, *see also* Radioactive minerals
  Carbon Co.: Wherry, E.T. 2
  Delaware Co.: Wherry, E.T. 2
  Montgomery Co.: Gehman, G.W. 1
  Philadelphia Co.: Lewis, H.C. 23; Wherry, E.T. 2

AVES
  Blair Co., Quaternary: Holland, W.J. 1; Peterson, O.A. 1
  Montgomery Co., Port Kennedy cave, Pleistocene: Wheatley, C.M. 2
  Westmoreland Co., Pennsylvanian: King, A.T. 1; Lyell, C. 3

AXINITE
  Delaware Co.: Wherry, E.T. 15
  Northampton Co.: Frazier, B.W. 1

AZURITE
  Chester Co.: Smith, J.L. 1

BACTERIA
  Schuylkill Co., Pennsylvanian: Turner, H.G. 3

BARITE
  Armstrong Co.: Hamilton, H.V. 1
  Bedford Co.: Lewis, H.C. 20
  Blair Co., Tyrone quadrangle: Butts, C. 18
  Bucks Co.: Silliman, B. 1; Stone, R.W. 47
    Trenton quadrangle: Bascom, F. 10
  Centre Co.
    Bellefonte quadrangle: Butts, C. 16
    Tyrone quadrangle: Butts, C. 18
  Franklin Co.: Lewis, H.C. 20; Stone, R.W. 47; Stose, G.W. 2; Tooker, E.W. 1
    Chambersburg quadrangle: Stose, G.W. 10
  Fulton Co.: Stone, R.W. 47
  Huntingdon Co.: Lewis, H.C. 20
    Tyrone quadrangle: Butts, C. 18
  Luzerne Co.: Northup, M.A. 3
  Montgomery Co.: Lewis, H.C. 1
  Pennsylvania: Ashley, G.H. 76; Stone, R.W. 39; Watson, T.L. 2
  Philadelphia Co., Trenton quadrangle: Bascom, F. 10

BARIUM, *see also* barium-bearing minerals
  Western brines: Heck, E.T. 1

BARRANDITE
  Cumberland Co.: Gordon, S.G. 9

BASALT, *see also* Volcanic rocks
  Adams Co.: Williams, G.H. 2
  Franklin Co.: Williams, G.H. 2
  Lancaster Co., glassy; Tomlinson, W.H. 3
  Lebanon Co.
    Ordovician: Gordon, S.G. 4; Stose, G.W. 24
    Triassic: Stose, G.W. 23
  Southeastern: Bascom, F. 20

BASINS
  Pittsburgh, Western: Richardson, G.B. 8
  Pittsburgh-Huntingdon, Western; Richardson, G.B. 7

BEAVER COUNTY, *see also* Pennsylvania, and Pennsylvania-Western

Areal geology
  Beaver Co.: White, I.C. 6
  Beaver quadrangle: Woolsey, L.H. 3
  Beaver River valley; Patton, L.T. 1
  Burgettstown quadrangle: Shaw, E.W. 3
  New Castle quadrangle: De Wolf, F.W. 1
  Sewickley quadrangle: Munn, M.J. 5
  southern: Stevenson, J.J. 3
  Zelienople quadrangle: Richardson, G.B. 12

Economic geology
  cement, New Castle quadrangle: De Wolf, F.W. 1

clay: Leighton, H. 5; Mansfield, I.F. 3; Woolsey, L.H. 1
  analyses: McCreath, A.S. 2; Woolsey, L.H. 1
  Beaver quadrangle: Woolsey, L.H. 3, 4
  Burgettstown quadrangle: Shaw, E.W. 3
  New Castle quadrangle: De Wolf, F.W. 1
  Sewickley quadrangle: Munn, M.J. 5
  Zelienople quadrangle: Richardson, G.B. 12
coal, bituminous: Sisler, J.D. 3, 27; White, I.C. 2, 6
  analyses: McCreath, A.S. 2
  Beaver quadrangle: Woolsey, L.H. 3, 4
  Burgettstown quadrangle: Griswold, W.T. 1; Shaw, E.W. 3
  New Castle quadrangle: De Wolf, F.W. 1
  Sewickley quadrangle: Munn, M.J. 5
  Zelienople quadrangle: Richardson, G.B. 12
coal, cannel: Ashley, G.H. 1; Mansfield, I.F. 3
gravel: Shaw, E.W. 1
  Burgettstown quadrangle: Shaw, E.W. 3
iron, Zelienople quadrangle: Richardson, G.B. 12
limestone: Mansfield, I.F. 3
  analyses: McCreath, A.S. 2
  Beaver quadrangle: Woolsey, L.H. 3, 4
  Burgettstown quadrangle: Shaw, E.W. 3
  New Castle quadrangle: De Wolf, F.W. 1
  Sewickley quadrangle: Munn, M.J. 5
  Zelienople quadrangle: Richardson, G.B. 12
natural gas
  Beaver quadrangle: Woolsey, L.H. 3, 4
  Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
  New Castle quadrangle: De Wolf, F.W. 1
  Sewickley quadrangle: Munn, M.J. 5
  Zelienople quadrangle: Richardson, G.B. 12
petroleum: Mansfield, I.F. 3
  Beaver quadrangle: Woolsey, L.H. 3, 4
  Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
  New Castle quadrangle: De Wolf, F.W. 1
  Sewickley quadrangle: Munn, M.J. 4, 5
  Zelienople quadrangle: Richardson, G.B. 12
sand: Shaw, E.W. 1
  Beaver quadrangle: Woolsey, L.H. 4
  Sewickley quadrangle: Munn, M.J. 5
  Zelienople quadrangle: Richardson, G.B. 12
sand and gravel, New Castle quadrangle: De Wolf, F.W. 1
sandstone: Mansfield, I.F. 3
  Beaver quadrangle: Woolsey, L.H. 3, 4
  New Castle quadrangle: De Wolf, F.W. 1
  Zelienople quadrangle: Richardson, G.B. 12
shale: Leighton, H. 5
  Beaver quadrangle: Woolsey, L.H. 3, 4
  Burgettstown quadrangle: Shaw, E.W. 3
  New Castle quadrangle: De Wolf, F.W. 1
  Zelienople quadrangle: Richardson, G.B. 12
stone
  New Castle quadrangle: De Wolf, F.W. 1
  Sewickley quadrangle: Munn, M.J. 5

Ground water
artesian well: Clapp, F.G. 10
Beaver Co.: Leggette, R.M. 1
New Castle quadrangle: De Wolf, F.W. 1

Historical geology
Devonian, Sewickley quadrangle: Munn, M.J. 4
Devonian-Pennsylvanian
  Beaver quadrangle: Woolsey, L.H. 4
  Sewickley quadrangle: Munn, M.J. 5
Devonian-Permian, Burgettstown quadrangle: Griswold, W.T. 2
Devonian-Pleistocene, Burgettstown quadrangle: Shaw, E.W. 3
Pennsylvanian: White, I.C. 2, 3, 6
  Beaver quadrangle: Woolsey, L.H. 3
  Lower Kittanning coal: Hice, R.R. 4
  southern: Stevenson, J.J. 3
Pennsylvanian-Pleistocene
  New Castle quadrangle: De Wolf, F.W. 1
  Zelienople quadrangle: Richardson, G.B. 12

Maps
  Economic
    Beaver quadrangle, mineral resources: Woolsey, L.H. 3, 4
    Burgettstown quadrangle, mineral resources: Shaw, E.W. 3

- petroleum
  - Dry—Island Run area: White, I.C. 6
  - Sewickley quadrangle: Munn, M.J. 4
- petroleum and gas
  - New Castle quadrangle: De Wolf, F.W. 1
  - Burgettstown quadrangle: Griswold, W. T. 2; Shaw, E.W. 3
  - Sewickley quadrangle: Munn, M.J. 5
- Sewickley quadrangle, mineral resources: Munn, M.J. 5
- Geologic: Lesley, J.P. 46, 47; White, I.C. 6
  - Beaver quadrangle: Woolsey, L.H. 3
  - Burgettstown quadrangle: Shaw, E.W. 3
  - New Castle quadrangle: De Wolf, F.W. 1
    - surficial deposits: De Wolf, F.W. 1
  - Sewickley quadrangle: Munn, M.J. 5
  - Zelienople quadrangle: Richardson, G.B. 12
- Structure, Beaver quadrangle: Woolsey, L.H. 3
- Structure contour
  - Beaver quadrangle: Woolsey, L.H. 4
    - Upper Freeport coal: Woolsey, L.H. 3
  - Burgettstown quadrangle, Pittsburgh coal: Griswold, W.T. 1, 2; Shaw, E.W. 3
  - New Castle quadrangle, Middle Kittanning coal: De Wolf, F.W. 1
  - Sewickley quadrangle
    - Ames limestone, Pennsylvanian: Munn, M.J. 4, 5
    - Hundred-foot sand, Devonian: Munn, M.J. 4, 5

Paleontology
- amphibians, Pennsylvanian: Cope, E.D. 12; Moodie, R.L. 3
- eurypterid, Pennsylvanian: Mansfield, I.F. 1, 3
  - Darlington Formation: Hall, C.E. 3; Hall, J. 6
- fish, Pennsylvanian: Westoll, T.S. 1
- fungus, Pennsylvanian, Darlington shale: Lesquereux, L. 12
- insect, Pennsylvanian: Scudder, S.H. 3, 4, 7
- plants, Pennsylvanian: King, A.T. 4; Lesquereux, L. 14

Petrology
- coal, pebble-bearing: Lesley, J.P. 45

Physical geology
- structure: White, I.C. 6
  - Lower Kittanning coal, distortion: Hice, R.R. 5

Physiography
- Beaver quadrangle: Woolsey, L.H. 3
- drainage changes, Beaver River: White, I.C. 6
- glacial geology, New Castle quadrangle: De Wolf, F.W. 1
- glacial gravel: Shaw, E.W. 1
- terraces, Pleistocene; Stevenson, J.J. 3; White, I.C. 6

BEDFORD COUNTY, *see also* Pennsylvania, and Pennsylvania-Western

Areal geology
- Bedford Co.: Stevenson, J.J. 8
- Bedford Springs area: Hayden, H.H. 1
- Broadtop coal field: Lesley, J.P. 2
- Ebensburg quadrangle: Butts, C. 4
- Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Pawpaw quadrangle: Stose, G.W. 12
- Windber quadrangle: Richardson, G.B. 11

Economic geology
- cement, Pawpaw quadrangle: Stose, G.W. 12
- clay
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- coal, bituminous: Fluck, F. 1; Stevenson, J.J. 8
  - Broadtop basin: Gardner, J.H. 1
  - Devonian: Taylor, R.C. 7
  - Ebensburg quadrangle: Butts, C. 4
  - Huntingdon quadrangle: Butts, C. 20
  - Windber quadrangle: Richardson, G.B. 11
- copper: Ross, C.S. 2
- fire clay: Stevenson, J.J. 8
- iron: Lesley, J.P. 13; Stevenson, J.J. 8; Taylor, R.C. 7
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Sherman Valley: Kerns, W.H. 1
- kaolin: Leighton, H. 7
- limestone: Stevenson, J.J. 8
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Pawpaw quadrangle: Stose, G.W. 12
- manganese, Sherman Valley area: Foose, R.M. 8; Kerns, W.H. 1
- sand, Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- sandstone, Windber quadrangle: Richardson, G.B. 11

- shale
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- stone: Stevenson, J.J. 8
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20

Ground water
- Ebensburg quadrangle: Butts, C. 4; Clapp, F.G. 2
- Flintstone quadrangle: Martin, G.C. 2
- mineral springs: Stevenson, J.J. 8

Historical geology
- Cambrian-Pennsylvanian, Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Devonian: Cameron, N.S. 1
- Devonian-Pennsylvanian
  - Ebensburg quadrangle: Butts, C. 4
  - Windber quadrangle: Richardson, G.B. 11
- Mississippian: Reger, D.B. 1
- Ordovician-Pennsylvanian: Stevenson, J.J. 8
- Ordovician-Tertiary, Pawpaw quadrangle: Stose, G.W. 12
- Pennsylvanian: Lesley, J.P. 2; White, I.C. 14
- Pennsylvanian-Permian, Broadtop basin: Gardner, J.H. 1
- Silurian-Devonian: Miller, E. 1

Maps
- Economic
  - Ebensburg quadrangle, mineral resources: Butts, C. 4
  - iron, Broadtop area: Lesley, J.P. 13
  - Windber quadrangle, mineral resources: Richardson, G.B. 11
- Geologic: Lesley, J. P. 46, 47; Platt, F. 16; Stevenson, J.J. 8
  - Broadtop basin: Gardner, J.H. 1
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Northcentral: Platt, F. 15
  - Pawpaw quadrangle: Stose, G.W. 12
  - Sherman Valley area: Foose, R.M. 8
  - Windber quadrangle: Richardson, G.B. 11
- Structure
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Pawpaw quadrangles: Stose, G.W. 12
  - Windber quadrangle: Richardson, G.B. 11
- Structure contour
  - Broadtop field, Kelley coal: Gardner, J.H. 1
  - Ebensburg quadrangle, Upper Freeport coal: Butts, C. 4
  - Windber quadrangle, Lower Kittanning coal: Richardson, G.B. 11

Mineralogy
- barite: Lewis, H.C. 20
- iron, native, arsenic-bearing: Shepard, C.U. 1

Paleontology
- ammonoids, Devonian: Miller, A.K. 2
- Pennsylvanian biota: Gardner, J.H. 1
- trilobite, Ordovician: Haldeman, S.S. 2

Physical geology
- cave concretions: Stone, R.W. 32
- joints, cleavage, relation to bedding: Foose, R.M. 12
- structure: Stevenson, J.J. 8
  - Broadtop coal field: Lesley, J.P. 2

Physiography
- meanders, Raystown branch of Juniata: Stone, R.W. 40

BENTONITE, *see also* Ash, and Volcanic rocks
- Central, Ordovician: Bonine, C.A. 2; Rosenkrans, R.R. 1; Whitcomb, L. 2
- Centre Co.: Ross, C.S. 1
- Franklin Co., Ordovician: Whitcomb, L. 5
- Pennsylvania, Ordovician: Rosenkrans, R.R. 2. 3; Whitcomb, L. 7

BERAUNITE
- Cumberland Co.: Gordon, S.G. 9
- Northampton Co.: Wherry, E.T. 15

BERKS COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Southeastern
- gravity investigation: Hersey, J.B. 2

Areal geology
- New Holland quadrangle: Jonas, A.I. 7
- Oley Valley: Bertelet, P.G. 1
- Reading area: Wherry, E.T. 19
- Reading Prong: D'Invilliers, E.V. 1
- South Mountain area: Eaton, H.N. 1

Economic geology
- cement: Eckel, E.C. 1
  - Jacksonburg limestone: Miller, B.L. 19
- gold, Reading area: Corbin, J.R. 6
- graphite: Ihne, F.W. 1; Miller, B.L. 3
  - Pickering gneiss: Miller, B.L. 4
- iron: D'Invilliers, E.V. 1; Spencer, A.C. 2
- limestone: D'Invilliers, E.V. 8
- manganese: Miller, B.L. 7
- paint ore: Stoddard, J.C. 1

- slate, northern: Sanders, R.H. 2
- stone: Rand, T.D. 26

Historical geology
- Cambrian-Ordovician, Oley Valley: Bertelet, P.G. 1
- Ordovician-Silurian: Willard, B. 47
- Precambrian-Ordovician: Miller, B.L. 31
- Precambrian-Pleistocene, northern: Lesley, J.P. 42
- Precambrian-Triassic: D'Invilliers, E.V. 1; Eaton, H.N. 1; Leidy, J. 14
  - New Holland quadrangle: Jonas, A.I. 7
- Triassic, Spitzenberg conglomerate: Whitcomb, L. 4, 8

Maps
- Economic
  - cement rock: Miller, B.L. 19
  - limestone: D'Invilliers, E.V. 8
- Geologic: Lesley, J.P. 46, 47, 49, 63
  - Boyertown area: Spencer, A.C. 2
  - Jones mine area: Spencer, A.C. 2
  - northern: Lesley, J.P. 42
  - New Holland quadrangle: Jonas, A.I. 7
  - Oley Valley: Bertelet, P.G. 1
  - Reading area: Willard, B. 48
    - south: Spencer, A.C. 2
  - Reading Prong: Eaton, H.N. 1; Lesley, J.P. 42, 48; Stose, G.W. 36
  - slate belt: Behre, C.H. 9
  - Triassic, Robeson conglomerate: McLaughlin, D.B. 3
  - Wheatfield mine area: Spencer, A.C. 2

Mineralogy
- allanite: Genth, F.A. 7; Smith, S. 1
- apophyllite: Sadtler, B. 1; Smith, E.F. 4; Thomas, C.A. 5
- aragonite: Genth, F.A. 21
- brucite: Genth, F.A. 21; Schoenfeld, J. 1
- calcite: Thomas, C.A. 5
- chabazite: Sadtler, B. 1; Smith, E.F. 4; Thomas, C.A. 5
- crocidolite: Wherry, E.T. 27
- damourite: Genth, F.A. 18
- deweylite: Brunner, D.B. 1; Genth, F.A. 21
- epidesmine: Gordon, S.G. 2
- glaucophane: Bliss, E.F. 1
- heulandite: Rand, T.D. 26; Thomas, C.A. 5
- jasper, popular: Myers, R.E. 2
- laumontite: Rand, T.D. 26; Smith, E.F. 4; Thomas, C.A. 5
- melaconite: Thomas, C.A. 5
- mesolite: Sadtler, B. 1
- molybdenite: Wetherill, C.M. 1
- prehnite: Fraser, D.M. 9; Thomas, C.A. 5
- pyroxene: Smith, E.F. 4
- scolectite: Smith, E.F. 4
- sericite: Frazer, D.M. 5
- serpentine: Genth, F.A. 21
- stilbite: Brunner, D.B. 1; Davidson, F.P. 1; Hoskinson, W.S. 1; Thomas, C.A. 5
- titanite: Brunner, D.B. 1
- vesuvianite: Brunner, D.B. 1
- venerite: Hunt, T.S. 5
- zeolite: Barton, B.S. 2
- zircon: Smith, S. 1; Wetherill, C.M. 1

Paleontology
- algae: Fenton, C.L. 1
- vertebrate fauna, Quaternary, Durham cave: Leidy, J. 16
- worm, Cambrian: Haldeman, S.S. 1; Howell, B.F. 2

Petrology
- andesite
  - Ordovician: Russell, G.C. 1
    - metamorphosed: Fraser, D.M. 7
- diabase
  - Ordovician, metamorphosed: Fraser, D.M. 7
  - Precambrian: Jonas, A.I. 3
- Hardyston quartzite, Cambrian: Fraser, D.M. 10; Merrill, G.P. 1
- limestone, Annville area: Miller, B.L. 16

Physical geology
- Annville area, limestone weathering: Miller, B.L. 16
- earthquakes: Neumann, F. 1
- faulting, Triassic: McLaughlin, D.B. 4
- Reading overthrust: Miller, B.L. 51; Stose, G.W. 36
- Schuylkill water gap: Chance, H.M. 9
- structure: Chance, H.M. 9
  - Reading Prong: Eaton, H.N. 1

Physiography
- boulder field: Wherry, E.T. 28
- caves: Miller, R.L. 6

BERYL
- Chester Co.: Seal, T. 1; Stone, R.W. 47
- Delaware Co.: Stone, R.W. 47
- (morganite), Montgomery Co.: Haeberle, W.F. 1
- Philadelphia Co.: Carpenter, G.W. 1

BIBLIOGRAPHY
- Ashburner, C.A.: Hill, F.A. 6; Winslow, A. 3
- Barrell, J.: Anon. 22; Schuchert, C. 7, 13; Vaughan, T.W. 1
- Bascom, F.: Knopf, E.B. 5
- Bayley, W.S.: Leighton, M.M. 1
- Beecher, C.E.: Clarke, J.M. 2; Dall, W.H. 3; Jackson, R.T. 1; Schuchert, C. 1, 2

Blake, W.P.: Raymond, P.E. 2; Raymond, R.W. 3
Brown, A.P.: Penrose, R.A.F. 1
Brown, T.C.: Mather, K.F. 1
Brush, G.J.: Dana, E.S. 5; Ford, W.E. 1
Butts, C.: Bevan, A.C. 3
Cambrian: Walcott, C.D. 3
Campbell, M.R.: Ashley, G.H. 71
Clapp, F.G.: Washburne, C.W. 1
Clarke, J.M.: Schuchert, C. 12, 16
Claypole, E.W.: Comstock, T.B. 1, 2
Cook, G.H.: Neilson, J. 1
Cope, E.D.: Frazer, P. 41, 44; King, H.D. 1; Osborn, H.F. 6, 7, 9
Crustacea, Paleozoic: Vodges, A.W. 2, 3
Dana, J.D.: Beecher, C.E. 4; Dana, E.S. 4; Gilman, D.C. 1; LeConte, J. 1; Pirsson, L.V. 5
Dean, B.: Gregory, W.K. 1
Devonian: Willard, B. 53
Devonian fauna: Nelson, L.A. 1
D'Invilliers, E.V.: Ashley, G.H. 55
Eastman, C.R.: Dean, B. 2
Fenneman, N.M.: Bucher, W.H. 1; Rich, J.L. 2
Foerste, A.F.: Bassler, R.S. 4
Foote, A.E.: Kunz, G.F. 1
Frazer, P., Jr.: Penrose, R.A.F. 1
Genth, F.A.: Barker, G.F. 1; Myers, W.M. 3
Geologic maps: Marcou, J. 5
Gesner, A.: Matthew, G.F. 1
Girty, G.H.: Williams, J.S. 1
Grabau, A.W.: Shimer, H.W. 2
graphite: Miller, B.L. 3
groundwater: Fuller, M.L. 6
  analyses: Collins, W.D. 1
Halberstadt, B.: Ashley, G.H. 60
Haldeman, S.S.: Brinton, D.G. 1
Hall, G.M.: Singewald, J.T. 1
Hall, J.: Hovey, H.C. 1; Murray, D. 1; Stevenson, J.J. 16
Heilprin, A.: Gregory, H.E. 1
Hice, R.R.: Ashley, G.H. 34
Hill, F.A.: Halberstadt, B. 5
Hitchcock, E.H.: Upham, W. 1
Honess, A.P.: Krynine, P.D. 9; Myers, W.M. 1
Hopkins, T.C.: Ploger, L.W. 1
Hovey, E.O.: Kemp, J.F. 10
iron ore: Corbin, J.R. 2
James, J.F.: Stanton, T.W. 1
Johnson, D.W.: Bucher, W.H. 2; Hsu, Guin-Tze, 1; Wright, F.J. 1
Kemp, J.F.: Adams, F.D. 1
Keith, A.: Larsen, E.S. 2
Kindle, E.M.: Cumings, E.R. 2
Lacoe, R.D.: Hayden, H.E. 1; White, C.D. 7
lead: Miller, B.L. 13
Lehigh Co.: Miller, B.L. 42
Leidy, J.: Chapman, H.C. 1; Eyerman, J. 4; Osborn, H.F. 4; Ruschenberger, W.S.W. 1
Lesley, J.P.: Stevenson, J.J. 18, 21
Lesquereux, L.: Orton, E. 1
Leverett, F.: Hobbs, W.H. 3
Lewis, H.C.: Upham, W. 1
McGee, WJ: Knowlton, F.H. 1
Maclure, W.: Morton, S.G. 2, 3
Marsh, O.C.: Beecher, C.E. 3; Grinnell, G.B. 1; Schuchert, C, 20, 22
Mathews, E.B.: Swartz, C.K. 9
Merrill, G.P.: Lindgren, W. 2
Miller, B.L.: Ashley, G.H. 79, 80
mineralogy: Gordon, S.G. 7
natural gas: Cathcart, S.H. 14; Hollick, C. A. 1; Kemp, J.F. 1, 2, 3; Peckham, S.F. 2; Stevenson, J.J. 13; White, C.A. 2
Northampton Co.: Miller, B.L. 35
paleobotany: Ward, L.F. 1
Penfield, S.L.: Pirsson, L.V. 3; Wells, H.L. 2
Penhallow, D.P.: Barlow, A.E. 1
Pa. Geol. Survey, 2d
  Final Summary Report: Ingham, W.A. 1
  publications: Ingham, W.A. 2
Pennsylvania geology to 1876: Lesley, J.P. 26
petroleum: Burroughs, E.H. 1; Cathcart, S.H. 14; Peckham, S.F. 2
Platt, F.: Frazer, P. 43
Precambrian: Van Hise, C.R. 1
Prosser, C.S.: Cumings, E.R. 1
Resser, C.E.: Howell, B.F. 6
Roddy, H.J.: Miller, B.L. 50
Rogers, H.D.: Gregory, J.W. 1
Salisbury, R.D.: Chamberlin, R.T. 2
Scudder, S.H.: Dimmock, G. 1
Shaw, E.W.: Westgate, L.G. 1
Sisler, J.D.: Ashley, G.H. 59
Smith, E.F.: Meeker, G.H. 1
Stevenson, J.J.: White, I.C. 28
structural maps, Western: Postley, O.C. 2
Triassic: Russell, I.C. 1
trilobites, Paleozoic: Vodges, A.W. 2
Troost, G.: Glenn, L.C. 2
Ulrich, E.O.: Bassler, R.S. 5
Vaux, G. Jr.: Gordon, S.G. 11
Walcott, C.D.: Anon. 28; Darton, N.H. 10; Smith, G.O. 3
Ward, F.: Miller, B.L. 49
White, C.D.: Mendenhall, W.C. 3; Schuchert, C. 19
White, I.C.: Fairchild, H.L. 2; Hennen, R.V. 1
Wiliams, E.H., Jr.: Miller, B.L. 21
Williams, G.H.: Clark, W.B. 1; Williams, T. 1

Williams, H.S.: Cleland, W.F. 1
Wright, G.F.: Upham, W. 3
zinc: Miller, B.L. 13

BINDHEIMITE, *see also* Radioactive minerals
Delaware Co.: Wherry, E.T. 2

BIOGEOCHEMICAL INVESTIGATIONS
plant indicators, zinc, Lehigh Co.: Robinson, W.O. 1

BIOGRAPHY
Ashburner, C.A.: Lesley, J.P. 58, 59, 60; Winslow, A. 3
Baird, S.F.: Billings, J.S. 1; Holder, C.F. 1
Barrell, J.: Anon. 22; Gregory, H.E. 2; Schuchert, C. 6, 7, 13; Shroder, F.C. 1; Willis, B. 9
Bascom, F.: Knopf, E.F.B. 5; Ogilivie, I.H. 1
Bayley, W.S.: Leighton, M.M. 1
Beecher, C.E.: Bather, F.A. 2; Clarke, J.M. 2; Dall, W.H. 2, 3; Jackson, R.T. 1; Schuchert, C. 1, 2
Blake, W.P.: Anon. 20; Raymond, R.W. 2, 3
Blandy, J.F.: Raymond, R.W. 1
Brown, A.P.: Penrose, R.A.F. 1; Wherry, E.T. 24
Brown, T.C.: Mather, K.F. 1
Brush, G.J.: Dana, E.S. 5; Ford, W.E. 1; Warren, C.H. 1
Butts, C.; Bevan, A.C. 3; Nelson, W.A. 2
Campbell, M.R.: Ashley, G.H. 71; Richardson, G.B. 13
Chance, H.M.: Anon. 38
Clapp, F.G.: Pratt, W.E. 1; Washburne, C.W. 1
Clarke, J.M.: Schuchert, C. 9, 10, 12, 16; Walcott, C.D. 10; Woodward, A.S. 2
Clarke, W.B.: Anon. 23
Claypole, E.W.: Comstock, T.B. 1, 2
Conrad, T.A.: Abbott, C.C. 1
Cook, G.H.: Gilbert, G.K. 2; Neilson, J. 1
Cope, E.D.: Benjamin, M. 1; Frazer, P. 42; Gill, T.N. 1; King, H.D. 1; Kingsley, J.S. 1; Osborn, H.F. 1, 2, 3. 7, 8, 9; Scott, W.B. 1; Woodward, A.S. 1
Dana, J.D.: Beecher, C.E 4; Dana, E.S. 4; Gilman, D.C. 1; Hadley, A.T. 1, 2; LeConte, J. 1; Pirsson, L.V. 5; Powell, J.W. 2; Rice, W.N. 1, 2
Darton, N.H.: Monroe, W.H. 1
Davis, W.M.: Huntingdon, E. 1
Dean, B.: Gregory, W.K. 1
D'Invilliers, E.V.: Ashley, G.H. 55
Eastman, C.R.: Dean, B. 1, 2
Eaton, A.: Anon. 10
Featherstonhaugh, G.W.: Featherstonhaugh, J.D. 1
Fenneman, N.M.: Bucher, W.H. 1; Rich, J.L. 2; Walters, R. 1
Foerste, A.F.: Bassler, R.S. 4
Foote, A.E.: Kunz, G.F. 1
Frazer, P., Jr.: Davison, A.C. 1; Penrose, R.A.F. 1
Genth, F.A.: Barker, G.F. 1; Myers, W.M. 3
Gesner, A.: Matthew, G.F. 1
Girty, G.F.: Williams, J.S. 1
Grabau, A.W.: Shimer, H.W. 2
Halberstadt, B.: Ashley, G.H. 60
Haldeman, S.S.: Brinton, D.G. 1
Hall, G.M.: Singewald, J.T. 1
Hall, J.: Anon. 8; Clarke, J.M. 1, 7, 8; Emerson, B.K. 1; Gratacap, L.P. 1; Hovey, H.C. 1; Nevius, J.N. 1; Stevenson, J.J. 16; Williams, H.S. 7
Hayden, F.V.: Peale, A.C. 2
Heilprin, A.: Anon. 18, 19; Gregory, H.E. 1; Levy, L.E. 1; Pirsson, L.V. 4
Hice, R.R.: Ashley, G.H. 34
Hill, F.A.: Halberstadt, B. 5
Hitchcock, C.H.: Anon. 16
Hitchcock, E.: Anon. 13
Hitchcock, E.H.: Upham, W. 1
Honess, A.P.: Krynine, P.D. 9; Myers, W.M. 1
Hopkins, T.C.: Ploger, L.W. 1
Hovey, E.O.: Kemp, J.F. 10
Howell, E.E.: Gilbert, G.K. 3, 4
Hunt, T.S.: Dawson, J.W. 4; Douglas, J. 1; Frazer, P. 40; Laflamme, J.C.K. 1
James, J.F.: Stanton, T.W. 1
Jefferies, W.W.: Pennypacker, C.H. 1
Johnson, D.W.: Berkey, C.P. 3; Bucher, W.H. 2; Hsu, Guin-Tze 1; Lobeck, A.K. 2; Wright, F.J. 1; Wright, J.K. 1
Keith, A.: Larsen, E.S. 2; Stose, G.W. 42; Visher, S.S. 1
Kemp, J.F.: Adams, F.D. 1; Anon. 25, 27; Berkey, C.P. 1; Geijer, P. 1; Keyes, C.R. 7; Knappen, R.F. 1; Lindgren, W. 1; Reeds, C.A. 1; Richard, T.A. 1; Schuchert, C. 15
Kindle, E.M.: Cumings, E.R. 2
Lacoe, R.D.: Anon. 17; Hayden, H.E. 1; White, C.D. 7
Lea, I.: Anon. 9
Leidy, J.: Brooks, W.K. 1; Chapman, H.C. 1, 2; Clarke, F.W. 3; Frazer, P. 39; Minot, C.S. 1; Osborn, H.F. 4, 5; Ruschenberger, W.S.W. 1; Scott, W.B. 2

Lesley, J.P.: Ames, M.L. 1; Chance, H.M. 17; Davis, W.M. 7; Frazer, P. 45; Halberstadt, B. 2; Lyman, B.S. 13; Stevenson, J.J. 18, 21; Whitcomb, L. 6
Lesquereux, L.: Darrah, W.C. 3; Lesley, J.P. 61, 68; Orton, E. 1
Leverett, F.: Alden, W.C. 1; Hobbs, W.H. 3; Keyes, C.R. 1; Trowbridge, A.C. 1
Lewis, H.C.: Frazer, P. 38; Upham, W. 1; Woodward, H. 1
Logan, W.E.: Harrington, B.J. 1
Maclure, W.: Morton, S.G. 3
Macfarlane, J.R.: Ashley, G.H. 69
McGee, WJ: Anon. 21; Knowlton, F.H. 1
Marsh, O.C.: Beecher, C.E. 3; Grinnell, G.B. 1, 2; Hague, A. 1; Joly, H. 1; Schuchert, C. 20, 22; Woodward, H. 2; Wortman, J.L. 1
Mathews, E.B.: Cloos, E. 5; Singewald, J.T. 2; Swartz, C.K. 9
Merrill, G.P.: Lindgren, W. 2
Miler, B.L.: Anon. 24, 61; Ashley, G.H. 79, 80; Fretz, A.H. 2; Stewart, D. 1; Stone, R.W. 56
Miller, S.A.: Bather, F.A. 1; Billings, W.R. 1
Newberry, J.S.: Dawson, J.W. 5; Fairchild, H.L. 1; Hollick, C.A. 1; Kemp, J.F. 2, 3; Orton, E. 2; Stevenson, J.J. 13; White, C.A. 2
Owen, D.D.: Anon. 5; Peter, R. 1
Peck, F.B.: Fretz, A.H. 1
Penfield, S.L.: Miers, H.A. 1; Pirsson, L.V. 3; Wells, H.L. 1, 2
Penhallow, D.P.: Barlow, A.E. 1; Jeffery, E.C. 1
Pennsylvania geologists: Miller, S.A. 2
Phalen, W.C.: Bowles, O. 1
Platt, F.: Frazer, P. 43
Prosser, C.S.: Clarke, J.M. 5; Cumings, E.R. 1
Rand, T.D.: Drown, T.M. 1
Resser, C.E.: Cooper, G.A. 6; Howell, B.F. 6
Roddy, H.J.: Miller, B.L. 50
Rogers, H.D.: Anon. 14; Gregory, J.W. 1; Keyes, C.R. 5
Rogers, W.B.: Rogers, E. 1; Walker, F.A. 1
Russell, I.C.: Pirsson, L.V. 2
Salisbury, R.D.: Chamberlin, R.T. 2
Seaman, A.E.: Lane, A.C. 2
Shaler, N.S.: Lane, A.C. 1
Shaw, E.W.: Westgate, L.G. 1
Sheafer, P.W.: Lesley, J.P. 64
Shepard, C.U.: Anon. 12
Silliman, B.: Caswell, A. 1; Gilman, D.C. 2
Silliman, B., Jr.: Hunt, T.S. 14
Sisler, J.D.: Ashley, G.H. 79; Price, P.H. 4
Smith, B.L.: Lyman, F. 1
Smith, E.F.: Meeker, G.H. 1
Stevenson, J.J.: Keyes, C.R. 4; White, I.C. 28
Troost, G.: Glenn, L.C. 2
Ulrich, E.O.: Bassler, R.S. 5; Reeside, J.B. 2
Vaux, G., Jr.: Gordon, S.G. 11
Walcott, C.D.: Anon. 15, 26; Barrois, C. 1; Darton, N.H. 10; Keyes, C.R. 6; Marr, J.E. 1; Merriam, J.C. 1; Schuchert, C. 14, 17; Smith, G.O. 1, 2, 3; Troedsson, G.T. 1; Wilcox, W.D. 1; Woodward, A.S. 3
Ward, F.: Miller, B.L. 49; Rothrock, E.P. 1
Warner, A.J.: Taylor, F.H. 1
White, C.D.: Okla. Geol. Survey 1; Mendenhall, W.C. 1, 2, 3; Miser, H.D. 1, 2; Schuchert, C. 19; Shimer, H.W. 1; Stanton, T.W. 2
White, I.C.: Fairchild, H.L. 2; Hennen, R.V. 1; Keyes, C.R. 8; Schuchert, C. 18
Williams, E.H., Jr.: Miller, B.L. 21
Williams, G.H.: Clark, W.B. 1; Williams, T. 1
Williams, H.S.: Cleland, W.F. 1; Schuchert, C. 5
Willis, B.: Stose, G.W. 46
Wright, G.F.: Hubbard, G.D. 1; Upham, W. 3

BIOTITE, *see* Mica

BLAIR COUNTY, *see also* Pennsylvania, and Pennsylvania-Central
  Areal geology
    Blair Co.: Platt, F. 15
    Ebensburg quadrangle: Butts, C. 4
    Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
    Patton quadrangle: Campbell, M.R. 8
    Tyrone quadrangle: Butts, C. 18
  Economic geology
    barite, Tyrone quadrangle: Butts, C. 18
    clay: Moore, E.S. 2, 3
      Ebensburg quadrangle: Butts, C. 4
      Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
      Patton quadrangle: Campbell, M.R. 8
      Tyrone quadrangle: Butts, C. 18
    coal, bituminous: Platt, F. 15; Sisler, J.D. 27; White, C.D. 4; White, I.C. 17
      Ebensburg quadrangle: Butts, C. 4
      Mississippian: Ashburner, C.A. 34
      Patton quadrangle: Campbell, M.R. 8
    ganister: Butts, C. 10
      Tyrone quadrangle: Butts, C. 18

- iron: Platt, F. 15
  - analyses: Genth, F.A. 10
  - Hollidaysburg quadrangle: Butts, C. 20
  - Tyrone quadrangle: Butts, C. 18
- kaolin: Leighton, H. 7
- lead: Platt, F. 15
  - analyses; McCreath, A.S. 3
  - Sinking Valley area: Miller, B.L. 8, 13; Myers, W.M. 2; Reed, D.F. 1
  - Tyrone quadrangle: Butts, C. 18
- limestone
  - analyses: Genth, F.A. 10
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg quadrangle: Butts, C. 20
  - Patton quadrangle: Campbell, M.R. 8
  - Tyrone quadrangle: Butts, C. 18
- natural gas, Patton quadrangle: Campbell, M.R. 8
- sand, Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- sandstone, Patton quadrangle: Campbell, M.R. 8
- shale
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- stone: Butts, C. 10
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg quadrangle: Butts, C. 20
  - Tyrone quadrangle: Butts, C. 18
- white clay, Tyrone quadrangle: Butts, C. 18
- zinc: Platt, F. 15; Zeller, R.A. 3
  - analyses: McCreath, A.S. 3
  - Sinking Valley area: Miller, B.L. 8, 13; Myers, W.M. 2; Reed, D.F. 1
  - Tyrone quadrangle: Butts, C. 18

Ground water

- Ebensburg quadrangle: Butts, C. 4; Clapp, F.G. 2
- Tyrone quadrangle: Lohman, S.W. 4

Historical geology

- Cambrian-Mississippian, Tyrone quadrangle: Butts, C. 18
- Cambrian-Pennsylvanian: Butts, C. 13; Platt, F. 5, 6
  - Hollidaysburg quadrangle: Butts, C. 20
- Devonian: Butts, C. 7
  - Chemung Formation: Willard, B. 14
- Devonian-Mississippian: Swartz, F.M. 17
- Devonian-Pennsylvanian, Ebensburg quadrangle: Butts, C. 4
- Mississippian-Pennsylvanian: White, C.D. 4
  - Patton quadrangle: Campbell, M.R. 8
- Pennsylvanian: White, I.C. 14
- Silurian: Swartz, F.M. 6

Maps

- Economic
  - Ebensburg quadrangle, mineral resources: Butts, C. 4
  - Patton quadrangle
    - Lower Freeport coal: Campbell, M.R. 8
    - mineral resources: Campbell, M.R. 8
- Geologic: Lesley, J.P. 46; Platt, F. 16
  - eastern: Platt, F. 15
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Patton quadrangle: Campbell, M.R. 8
  - Tyrone quadrangle: Butts, C. 18
- Structure
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Structure contour
  - Ebensburg quadrangle, Upper Freeport coal: Butts, C. 4
  - Patton quadrangle, Lower Freeport coal: Campbell, M.R. 8

Mineralogy

- celestite: Mügge, O. 1; Young, C.A. 1

Paleontology

- amphibians, Quaternary: Peterson, O.A. 1
- birds, Quaternary: Holland, W.J. 1; Peterson, O.A. 1
- brachiopods, Silurian: Simpson, G.B. 2
- Devonian, Chemung Formation: Willard, B. 14
- Devonian fauna: Kindle, E.M. 1
- fish, Pennsylvanian: Leidy, J. 2
- mammals, Quaternary: Holland, W.J. 1; Peterson, O.A. 1
- plants
  - Devonian, Catskill Formation: Arnold, C.A. 9
  - Pennsylvanian: White, C.D. 4
- reptiles, Quaternary: Holland, W.J. 1; Peterson, O.A. 1
- Silurian, Rochester-McKenzie Formation fauna: Swartz, F.M. 6
- trilobites, Ordovician: Raymond, P.E. 6

Physical geology

- earthquakes: Anon. 47; Landsberg, H. 2; Neumann, F. 1
- faults: Butts, C. 12
  - Brush Mtn. area, topographic expression: Lesley, J.P. 12
  - Tipton Run area: White, C.D. 4; White, I.C. 17
- structure: Platt, F. 15
  - Sinking Valley area: Zeller, R.A. 3

Physiography
- Brush Mtn. area: Lesley, J.P. 12
- Lake Lesley, Pleistocene: Williams E.H. 13

BOULDER FIELDS, *see also* Physiography
- Berks Co.: Wherry, E.T. 28
- Bucks Co.: Ringing Rocks: Fackenthal, B.F. 1
- Carbon Co.: Smith, H.T.U. 1
- Delaware Co.: Martin, D.S. 2
- Pennsylvania: Peltier, L.C. 1

BRACHIOPODA
- Cambria Co., Pennsylvanian: Conrad, T.A. 1
- Carbon Co., Devonian: Willard, B. 43
- Clinton Co., Ordovician: Cooper, G.A. 2
- Cumberland Co., Cambrian: Walcott, C.D. 9
- Dauphin Co., Ordovician: Secrist, M.H. 1
- Fayette Co., Mississippian, Greenbrier limestone: Benson, F.M. 1
- Franklin Co., Cambrian: Walcott, C.D. 9
- Huntingdon Co., Mississippian, Pocono Formation: Girty, G.H. 3
- Lancaster Co., Cambrian: Resser, C.E. 3; Walcott, C.D. 9
- Luzerne Co., Pennsylvanian, Mill Creek limestone: Ashburner, C.A. 35
- Mifflin Co., Silurian, Keefer sandstone: Barnsley, E.R. 1
- Monroe Co., Devonian: Willard, B. 34
- Northumberland Co., Devonian: Willard, B. 26
- Northwestern, Devonian-Mississippian: Caster, K.E. 1; Girty, G.H. 4
- Pennsylvania
  - Cambrian: Hitchcock, C.H. 2
  - Devonian: Bye, D.L. 1; Willard, B. 39
  - Ordovician-Devonian: Conrad, T.A. 3
- Perry Co.
  - Devonian: Rafinesque, C.S. 1
    - Hamilton group: Claypole, E.W. 8
- Pike Co., Devonian, Hamilton group: Heilprin, A. 2
- York Co., Cambrian: Walcott, C.D. 9

BRADFORD COUNTY, *see also* Pennsylvania, Pennsylvanian-Northern, and Pennsylvania-Western

Areal geology
- Bradford Co.: Horton, G.F. 1; Sherwood, A. 1
- Susquehanna basin: Burroughs, W.G. 3

Economic geology
- coal, bituminous: Johnson, W.R. 4; Platt, F. 5; Sisler, J.D. 14, 27
- copper: Partz, A. 1
- iron: Johnson, W.R. 4; Platt, F. 5; Sherwood, A. 1
- limestone: Johnson, W.R. 4
- mineral resources: Wells, H. 1

Ground water
- Bradford Co.: Lohman, S.W. 3

Historical geology
- Cambrian-Pennsylvanian: Torrey, P.D. 3
- Devonian: Burroughs, W.G. 5; Lilley, A.T. 1; Sherwood, A. 1
  - Catskill Formation: Claypole, E.W. 3
  - Hamilton group: Reeves, J.R. 2

Maps
- Geologic: Horton, G.F. 1; Lesley, J.P. 46, 47; Sherwood, A. 1

Paleontology
- Devonian fauna: Williams, H.S. 2
  - Chemung Formation: Lilley, A.T. 1
- fish, Devonian
  - Catskill Formation: Chadwick, G.H. 1
  - Chemung Formation: Claypole, E.W. 2; Cope, E.D. 8
- nautiloid, Devonian: Flower, R.H. 2, 3

Physiography
- Susquehanna basin: Burroughs, W.G. 3

BREUNERITE, *see* Magnesite

BRONZITE, *see* Pyroxene

BRUCITE
- Berks Co.: Genth, F.A. 21; Schoenfeld, J. 1
- Lancaster Co.: Hermann, R. 4; Hessenberg, F. 1, 2; Rose, G. 1; Smith, J.L. 1

BRYOZOA
- Carbon Co., Devonian: Willard, B. 43
- Northern, Devonian: McNair, A.H. 1
- Pennsylvania, Paleozoic: Bassler, R.S. 1
- Pike Co., Devonian, Hamilton group: Heilprin, A. 2

BUCHOLZITE, *see* Sillimanite

BUCKS COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Southeastern
- gravity investigation: Hersey, J.B. 2
- gravity survey, Paleozoic-Triassic contact: Hersey, J.B. 1
- magnetic survey, Paleozoic-Triassic contact: Hersey, J.B. 1

Areal geology
- Allentown quadrangle: Miller, B.L. 14
- Doylestown-Quakertown quadrangles: Bascom, F. 17

- Easton quadrangle, Precambrian: Bayley, W.S. 2
- Germantown quadrangle: Bascom, F. 9
- Honeybrook-Phoenixville quadrangles: Bascom, F. 21
- Reading area: Willard, B. 48
- southern: Hall, C.E. 7
- Trenton quadrangle: Bascom, F. 10

Economic geology

- asbestos, Easton quadrangle: Bayley, W.S. 2
- barite: Stone, R.W. 47
  - Trenton quadrangle: Bascom, F. 10
- cement, Allentown quadrangle: Miller, B.L. 14
- clay
  - Allentown quadrangle: Miller, B.L. 14
  - Easton quadrangle: Bayley, W.S. 2
- copper: Lyman, B.S. 9
  - Allentown quadrangle: Miller, B.L. 14
  - Trenton quadrangle: Bascom, F. 10
- gold
  - New Britain area: Corbin, J.R. 6
  - Triassic: Lyman, B.S. 7
- graphite: Miller, B.L. 3, 4
  - Allentown quadrangle: Miller, B.L. 14
  - Trenton quadrangle: Bascom, F. 10
- gravel, Doylestown quadrangle: Bascom, F. 17
- iron: Bayley, W.S. 1; McCasky, H.D. 1; Trego, C.B. 2
  - Allentown quadrangle: Miller, B.L. 14
  - Easton quadrangle: Bayley, W.S. 2
- lead: Annear, J. 1
  - New Galena area: Miller, B.L. 9, 13
  - Triassic: Lyman, B.S. 7
- limestone
  - Allentown quadrangle: Miller, B.L. 14
  - Doylestown quadrangle: Bascom, F. 17
- manganese, Allentown quadrangle: Miller, B.L. 14
- mica
  - Allentown quadrangle: Miller, B.L. 14
  - Easton quadrangle: Bayley, W.S. 2
- paint ore
  - Allentown quadrangle: Miller, B.L. 14
  - Easton quadrangle: Bayley, W.S. 2
  - Triassic: Lyman, B.S. 7
- peat, Allentown quadrangle: Miller, B.L. 14
- sand
  - Doylestown quadrangle: Bascom, F. 17
  - Honeybrook quadrangle: Bascom, F. 21
- sand and gravel, Allentown quadrangle: Miller, B.L. 14
- slate, Allentown quadrangle: Miller, B.L. 14
- stone: Stone, R.W. 23
  - Allentown quadrangle: Miller, B.L. 14
  - Doylestown-Quakertown quadrangles: Bascom, F. 17
  - Easton quadrangle: Bayley, W.S. 2
  - Germantown quadrangle: Bascom, F. 9
  - Honeybrook quadrangle: Bascom, F. 21
  - Trenton quadrangle: Bascom, F. 10
  - Triassic: Lyman, B.S. 7
- talc, Easton quadrangle: Bayley, W.S. 2
- zinc
  - Allentown quadrangle: Miller, B.L. 14
  - Easton quadrangle: Bayley, W.S. 2
  - New Galena area: Miller, B.L. 9, 13

Ground water

- alluvial spring: Genth, F.A. 6
- Trenton quadrangle: Bascom, F. 10
- Philadelphia district: Bascom, F. 7

Historical geology

- Cambrian-Ordovician, Honeybrook quadrangle: Bascom, F. 21
- Cretaceous, clay: Lewis, H.C. 8
- Precambrian, Easton quadrangle: Bayley, W.S. 2
- Precambrian-Pleistocene, Allentown quadrangle: Miller, B.L. 14
- Precambrian-Quaternary, Trenton quadrangle: Bascom, F. 10
- Precambrian-Tertiary, Germantown quadrangle: Bascom, F. 9
- Precambrian-Triassic: Hall, C.E. 7
  - Doylestown-Quakertown quadrangles: Bascom, F. 17
- Triassic: Lyman, B.S. 7; McLaughlin, D.B. 9
  - alluvial fan: McLaughlin, D.B. 3
  - Brunswick Formation: McLaughlin, D.B. 2
  - Delaware River area: McLaughlin, D.B. 8, 10
  - Honeybrook quadrangle: Bascom, F. 21
  - Lockatong shale: McLaughlin, D.B. 7
  - Point Pleasant area: McLaughlin, D.B. 6
  - Revere area: McLaughlin, D.B. 5
  - Stockton Formation: McLaughlin, D.B. 7
  - well record: Lesley, J.P. 65

Maps

- Economic
  - Allentown quadrangle, mineral resources: Miller, B.L. 14
- Geologic: Lesley, J. P. 46, 47, 67
  - Allentown quadrangle: Miller, B.L. 14
  - Doylestown-Quakertown quadrangles: Bascom, F. 17
  - Easton quadrangle, Precambrian: Bayley, W.S. 2

    - Honeybrook-Phoenixville quadrangles: Bascom, F. 21
    - Reading Prong: Lesley, J.P. 42, 48
    - Revere area, Triassic: McLaughlin, D.B. 5
    - southern: Hall, C.E. 7
    - southern gneiss complex: Armstrong, E.J. 2
    - Trenton quadrangle: Bascom, F. 10
    - Triassic: Lyman, B.S. 7; McLaughlin, D.B. 3, 7
    - Wissahickon schist: Weiss, J. 3
  - Structure
    - southern gneiss complex: Armstrong, E.J. 2
    - Wissahickon schist: Weiss, J. 3
- *Mineralogy*
  - barite: Silliman, B. 1
  - calcite, fluorescent: Thomas, C.A. 1
  - feldspar: Morton, S.G. 1
  - garnet: Morton, S.G. 1
  - graphite: Morton, S.G. 1
  - mica: Morton, S.G. 1
  - mineral collecting: Benge, E. 2; Carpenter, G.W. 3; Vanartsdalen, J.F 1
  - moroxite: Morton, S.G. 1
  - muscovite: Neminarz, E.F. 2
  - pyrite: Morton, S.G. 1
  - pyroxene: Morton, S.G. 1
  - quartz: Morton, S.G. 1; Vanartsdalen, J.F. 3
    - inclusion-bearing: Bilgram, H. 1
  - rutile: Genth, F.A. 16
  - scapolite: Leeds, A.R. 2; Morton, S.G. 1
  - Vanartsdalen quarry: Vanartsdalen, J.F. 2
  - wollastonite: Morton, S.G. 1
  - wernerite: Leeds, A.R. 10
  - zircon: Genth, F.A. 16; Morton, S.G. 1; Wherry, E.T. 2
- *Paleontology*
  - algae: Fenton, C.L. 1
  - amphibian, Triassic: Ryan, J.D. 1
  - bison, post-Pliocene: Rhoads, S.N. 1
  - Cambrian fauna: Howell, B.F. 3
  - human works, post-Pleistocene: Lewis, H.C. 17
  - plants, Triassic: Brown, A.P. 4; Wherry, E.T. 20, 29
  - reptile, Triassic: Sinclair, W.J. 1
- *Petrology*
  - argillite, Triassic: Stevenson, R.E. 1
  - diabase, Triassic: Jonas, A.I. 3; Seybert, A. 1
  - gabbro-phonolite: Goldsmith, E. 1
  - gneiss: Armstrong, E.J. 2
  - metagabbro, scapolite-bearing: Weiss, J. 2
  - metamorphic rocks: Weiss, J. 1
  - mylonites: Armstrong, E.J. 2
  - norite: Kemp, J.F. 5
  - serpentine: Lewis, H.C. 12
  - shale, metamorphosed: Rogers, H.D. 13
  - Wissahickon schist: Weiss, J. 3
- *Physical geology*
  - faulting
    - Triassic: McLaughlin, D.B. 4
    - Yardleyville area: Lewis, H.C. 25
  - metamorphism: Lewis, H.C. 41
- *Physiography*
  - boulder fields
    - Ringing Rocks: Fackenthal, B.F. 1
    - popular: Anon. 42
  - gravels: Klingsburg, C. 1
  - stream capture: Davis, W.M. 3; Ward, R.D. 1

BURATITE, *see* Aurichalcite

BURIED VALLEYS
  - Indiana-Jefferson Cos., Pennsylvanian: Shaffner, M.N. 1
  - Lackawanna Co.: Itter, H.A. 1
    - Newport Creek: Ashburner, C.A. 31
    - Susquehanna River: Kemp, J.F. 8
  - Luzerne Co.: Darton, N.H. 5; Hill, F.A. 1; Itter, H.A. 1
    - Susquehanna River, Pleistocene: Darton, N.H. 8
  - Wyoming Co., Susquehanna River: Corss, F. 3

BUTLER COUNTY, *see also* Pennsylvania, and Pennsylvania-Western
  - meteorites: Smithsonian Inst. 1
    - Chicora area: Preston, F.W. 1
    - popular: Anon. 57
- *Areal geology*
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 4
  - Hilliards quadrangle: Sherrill, R.E. 4
  - Kittanning quadrangle: Butts, C. 3
  - New Kensington quadrangle: Richardson, G.B. 9
  - northern: Chance, H.M. 4
  - Sewickley quadrangle: Munn, M.J. 5
  - southern: White, I.C. 6
- *Economic geology*
  - clay: Leighton, H. 5
    - Butler-Zelienople quadrangles: Richardson, G.B. 12
    - Foxburg quadrangle: Shaw, E.W. 4
    - Kittanning quadrangle: Butts, C. 3, 6
    - Sewickley quadrangle: Munn, M.J. 5
  - coal, bituminous; Chance, H.M. 3; Rayburn, J.M. 1; Sisler, J.D. 4, 27
    - analyses: McCreath, A.S. 2
    - Butler-Zelienople quadrangles: Richardson, G.B. 12

  - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Kittanning quadrangle: Butts, C. 3, 6
  - New Kensington quadrangle: Richardson, G.B. 9
  - northern: Chance, H.M. 4
  - Sewickley quadrangle: Munn, M. J. 5
  - southern: White, I.C. 6
- connate water: Richardson, G.B. 3
- iron
  - analyses: McCreath, A.S. 2
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 4
  - Kittanning quadrangle: Butts, C. 3, 6
- limestone: Fettke, C.R. 6
  - analyses: McCreath, A. S. 2
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 4
  - Kittanning quadrangle: Butts, C. 3, 6
  - Sewickley quadrangle: Munn, M.J. 5
- natural gas
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Hilliards quadrangle: Sherrill, R.E. 9
  - Kittanning quadrangle: Butts, C. 3, 6
  - New Kensington quadrangle: Richardson, G.B. 9
  - Sewickley quadrangle: Munn, M.J. 5
- petroleum: Clark, H.R. 1
  - Butler-Zelienople quadrangle: Richardson, G.B 12
  - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Hilliards quadrangle: Sherrill, R.E. 4, 9
  - Kittanning quadrangle: Butts, C. 3, 6
  - New Kensington quadrangle: Richardson, G.B. 9
  - northern: Chance, H.M. 4
  - Sewickley quadrangle: Munn, M.J. 4, 5
- sand
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Kittanning quadrangle: Butts, C. 3
  - Sewickley quadrangle: Munn, M.J. 5
- sandstone
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 4
- shale: Leighton, H. 5
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 4
  - Kittanning quadrangle: Butts, C. 3, 6
- stone
  - Kittanning quadrangle: Butts, C. 3, 6
  - Sewickley quadrangle: Munn, M.J. 5

Ground water
- Butler Co.: Piper, A.M. 1

Historical geology
- Devonian
  - Hilliards quadrangle: Sherrill, R.E. 4
  - Sewickley quadrangle: Munn, M.J. 4
- Devonian-Mississippian: Chance, H.M. 5; Lucas, D.J. 1
  - Hilliards quadrangle: Sherrill, R.E. 9
- Devonian-Pennsylvanian
  - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Kittanning quadrangle: Butts, C. 3
  - northern: Chance, H.M. 4
  - Sewickley quadrangle: Munn, M.J. 5
- Pennsylvanian: Chance, H.M. 3
  - New Kensington quadrangle: Richardson, G.B. 9
  - southern: White, I.C. 6
  - Upper Freeport coal: Rayburn, J.M. 1
- Pennsylvanian-Pleistocene, Butler-Zelienople quadrangles: Richardson, G.B. 12

Maps
- Economic
  - Butler-Zelienople quadrangles, mineral resources: Richardson, G.B. 12
  - coal, bituminous, Foxburg quadrangle: Shaw, E.W. 2
  - Foxburg quadrangle, mineral resources: Shaw, E.W. 4
  - Kittanning quadrangle, mineral resources: Butts, C. 3
  - limestone, Kittanning quadrangle: Butts, C. 6
  - natural gas, Hilliards quadrangle: Sherrill, R.E. 9
  - petroleum: Carll, J.F. 3; Lesley, J.P. 51
    - Hilliards quadrangle: Sherrill, R.E. 4, 9
    - Sewickley quadrangle: Munn, M.J. 4
  - petroleum and gas
    - Foxburg quadrangle: Shaw, E.W. 2, 4
    - Sewickley quadrangle: Munn, M.J. 5
  - Sewickley quadrangle, mineral resources: Munn, M.J. 5
- Geologic: Lesley, J.P. 46, 47
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 2, 4

    - Kittanning quadrangle: Butts, C. 3, 6
    - northern: Chance, H.M. 4
    - Sewickley quadrangle: Munn, M.J. 5
    - southern: White, I.C. 6
  - Isopach, Hilliards quadrangle, Shira sand, Devonian: Sherrill, R.E. 7
  - Structure, Sixth coal basin: Chance, H.M. 4
  - Structure contour
    - Butler-Zelienople quadrangles, Vanport limestone, Pennsylvanian: Richardson, G.B. 12
    - Foxburg quadrangle, Vanport limestone, Pennsylvanian: Shaw, E.W. 2, 4
    - Hilliards quadrangle
      - Second sand, Devonian: Sherrill, R.E. 4
      - Shira sand, Devonian: Sherrill, R.E. 7
    - Kittanning quadrangle, Vanport limestone, Pennsylvanian: Butts, C. 3, 6
    - Sewickley quadrangle
      - Ames limestone, Pennsylvanian: Munn, M.J. 4, 5
      - Hundred-foot sand, Mississippian: Munn, M.J. 4, 5
- *Physical geology*
  - structural trends: Sisler, J.D. 4
  - structure
    - northern: Chance, H.M. 4
    - southern: White, I.C. 6
- *Physiography*
  - drainage changes, northern: Chance, H.M. 4
  - glacial foreland, popular: Preston, F.W. 2
  - glacial geology
    - Foxburg quadrangle: Shaw, E.W. 4
    - northern: Chance, H.M. 4

BYSSOLITE, *see* Actinolite

CACOXENITE
  - Cumberland Co.: Gordon, S.G. 9
  - Lancaster Co.: Goldsmith, E. 1

CALAMINE
  - Chester Co.: Smith, J.L. 1
  - Northampton Co.: Eyerman, J. 1

CALCITE
  - (argentine), Delaware Co.: Gordon, S.G. 1
  - Armstrong Co.: Hamilton, H.V. 1
  - Berks Co.: Thomas, C.A. 5
  - Bucks Co.: Thomas, C.A. 1
  - Chester Co.: Eyerman, J. 2; Gordon, S.G. 10; Smith, J.L. 1; Vaux, G. 2
  - Lehigh Co.: Thomas, C.A. 6
  - Luzerne Co.: Northup, M.A. 2
  - Montgomery Co.: Haeberle, W.F. 1; Thomas, C.A. 2, 7
  - Philadelphia Co.: Silliman, B. 1
  - Westmoreland Co.: Hamilton, H.V. 1

CAMBRIA COUNTY, *see also* Pennsylvania, and Pennsylvania-Western

- *Areal geology*
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Ebensburg quadrangle: Butts, C. 4
  - Johnstown quadrangle: Phalen, W.C. 3
  - Windber quadrangle: Richardson, G.B. 11
- *Economic geology*
  - cement, Johnstown quadrangle; Phalen, W.C. 3
  - clay: Phalen, W.C. 1; Ries, H. 5
    - Barnesboro-Patton quadrangles: Campbell, M. R. 8
    - Ebensburg quadrangle: Butts, C. 4
    - Johnstown quadrangle: Phalen, W.C. 3, 4
  - coal, bituminous: Burrows, J.S. 1; Butts, C. 2; Fulton, J. 2: Phalen, W.C. 2; Platt, F. 4: Sisler, J.D. 5. 27
    - analyses: Clemson, T.G. 2
    - Barnesboro-Patton quadrangles: Campbell. M. R. 8
    - Ebensburg quadrangle: Butts, C. 4
    - Johnstown quadrangle: Phalen, W.C. 3, 4
    - reserves: Reese, J.F. 4
    - Windber quadrangle: Richardson, G.B. 11
  - fire clay: Platt, F. 4
  - iron: Platt, F. 4
    - analyses: Clemson, T.G. 2
    - Johnstown quadrangle: Phalen, W.C. 3, 4
  - limestone
    - Barnesboro-Patton quadrangles: Campbell. M. R. 8
    - Ebensburg quadrangle: Butts, C. 4
    - Johnstown quadrangle: Phalen, W.C. 4
  - natural gas
    - Barnesboro-Patton quadrangles: Campbell, M. R. 8
    - Cherry Tree area: Platt, F. 4
    - Johnstown area: Fulton, J. 2
    - Song Hollow area: Fulton, J. 2
  - sand, Johnstown quadrangle: Phalen, W.C. 4
  - sandstone, Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - shale: Phalen, W.C. 1
    - Ebensburg quadrangle: Butts, C. 4
    - Johnstown quadrangle: Phalen, W.C. 3, 4

stone
  Ebensburg quadrangle: Butts, C. 4
  Johnstown quadrangle: Phalen, W.C. 3, 4
Ground water
 Ebensburg quadrangle: Butts, C. 4; Clapp, F.G. 2
 Patton quadrangle: Clapp, F.G. 2
Historical geology
 Devonian, Chemung Formation: Willard, B. 14
 Devonian-Pennsylvanian
  Ebensburg quadrangle: Butts, C. 4
  Johnstown quadrangle: Phalen, W.C. 3, 4
  Windber quadrangle: Richardson, G.B. 11
 Pennsylvanian: Platt, F. 4; Swartz, F.M. 17
  Barnesboro-Patton quadrangles: Campbell, M. R. 8
 Silurian-Pennsylvanian: Miller, E. 1
Maps
 Economic
  Barnesboro-Patton quadrangles, mineral resources: Campbell, M.R. 8
  coal, bituminous: Hogg, J.B. 1
   First bituminous basin: Platt, F. 4
  Ebensburg quadrangle, mineral resources: Butts, C. 4
  Johnstown quadrangle, mineral resources: Phalen, W.C. 3, 4
  Windber quadrangle, mineral resources: Richardson, G.B. 11
 Geologic: Lesley, J.P. 46; Platt, F. 4
  Barnesboro-Patton quadrangles: Campbell, M.R. 8
  Ebensburg quadrangle: Butts, C. 4
  Johnstown quadrangle: Phalen, W.C. 3
  Windber quadrangle: Richardson, G.B. 11
 Structure
  Ebensburg quadrangle: Butts, C. 4
  Windber quadrangle: Richardson, G.B. 1
 Structure contour
  Barnesboro-Patton quadrangles, Lower Freeport coal: Ashley, G.H. 10; Campbell, M.R. 8
  Ebensburg quadrangle, Upper Freeport coal: Butts, C. 4
  Johnstown quadrangle, Lower Kittanning coal: Phalen, W.C. 3, 4
  Windber quadrangle, Lower Kittanning coal: Richardson, G.B. 11
Paleontology
 brachiopods, Pennsylvanian: Conrad, T.A. 1
 Devonian, Chemung Formation: Willard, B. 14
 gastropods, Pennsylvanian: Conrad, T.A. 1
 pelecypods, Pennsylvanian: Conrad, T.A. 1
 plants, Pennsylvanian: Harlan, R. 3
Physical geology
 Laurel Hill anticline: Platt, F. 4
 structure: Sisler, J.D. 5
  Barnesboro-Patton quadrangles: Ashley, G.H. 10

CAMBRIAN, *see also* Paleozoic
 Adams Co.: Frazer, P. 13; Hickok, W.O. 8; Keith, A. 1; Stose, G.W. 21; Walcott, C.D. 5
  Fairfield-Gettysburg quadrangles: Stose, G.W. 27
  Hanover quadrangle: Stose, A.I.J. 1
 Bedford Co., Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
 Berks Co.: D'Invilliers, E.V. 1; Leidy, J. 14; Lesley, J.P. 42; Miller, B.L. 31
  Oley Valley area: Bertelet, P.G. 1
  South Mountain area: Eaton, H.N. 1
 Blair Co.: Butts, C. 13; Krynine, P.D. 10; Platt, F. 6, 15
  Hollidaysburg quadrangle: Butts, C. 20
  Tyrone quadrangle: Butts, C. 18
 Bradford Co.: Torrey, P.D. 3
 Bucks Co.: Hall, C.E. 7
  Allentown quadrangle: Miller, B.L. 14
  Doylestown-Quakertown quadrangles: Bascom, F. 17
  Germantown quadrangle: Bascom, F. 9
  Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  Trenton quadrangle: Bascom, F. 10
 Central: Rogers, H.D. 4; Ulrich, E.O. 3; Wilson, J.L. 2
 Centre Co.: Brown, T.C. 1; Krynine, P.D. 10
  Bellefonte quadrangle: Butts, C. 16
  Tyrone quadrangle: Butts, C. 18
 Chester Co.: Abbey, M.B. 1; Hartman, M.D. 1; Hawkins, A.C. 2; Jonas, A.I. 2; Lesley, J.P. 41; Stose, G.W. 18
  Coatesville-West Chester quadrangles: Bascom, F. 18
  Doe Run-Avondale area: Bliss, E.F. 2
  Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  Norristown quadrangle: Bascom, F. 9
  Quarryville quadrangle: Knopf, E.F.B. 4; Jonas, A.I. 6
 Clinton Co.: Chance, H.M. 1

Cumberland Co.: Hickok, W.O. 8
  Fairfield quadrangle: Stose, G.W. 27
Delaware Co.: Hall, C.E. 9; Rand, T.D. 20
  Norristown quadrangle: Bascom, F. 9
  Radnor area: Rand, T.D. 16
  West Chester quardangle: Bascom, F. 18
Erie Co.: Torrey, P.D. 3
Franklin Co.: Keith, A. 1; Stose, G.W. 6; Walcott, C.D. 5
  Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
  Fairfield quadrangle: Stose, G.W. 27
  Hancock quadrangle: Stose, G.W. 12
Fulton Co.
  Hancock quadrangle: Stose, G.W. 12
  Mercersburg quadrangle: Stose, G.W. 10
Huntingdon Co.: Butts, C. 13; Grant, A.M. 1
  Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  Tyrone quadrangle: Butts, C. 18
Lancaster Co.: Abbey, M.B. 1; Cloos, E. 8; Frazer, P. 23, 29; Platt, F. 16; Roddy, H.J. 1; Stose, G.W. 18; Walcott, C.D. 5
  Coatesville quadrangle: Bascom, F. 18
  Honeybrook quadrangle: Bascom, F. 21
  McCalls Ferry quadrangle: Knopf, E.F.B. 4; Jonas, A.I. 5
  Middletown quadrangle: Stose, G.W. 33
  New Holland quadrangle: Jonas, A.I. 7
  Olenellus zone: Resser, C.E. 3
  Quarryville quadrangle: Knopf, E.F.B. 4; Jonas, A.I. 6
  South Mountain area: Eaton, H.N. 1
Lebanon Co., South Mountain area: Eaton, H.N. 1
Lehigh Co.: Lesley, J.P. 42; Peck, F.B. 3; Prime, F. 2, 6
  Allentown quadrangle: Miller, B.L. 14
  Hardyston Formation: Miller, B.L. 43; Myers, P.B. 1; Prime, F. 7
  Hardyston-Tomstown contact: Whitcomb, L. 9
  Lehigh Valley: Peck, F.B. 8
  Lower Milford Twp.: Brown, C.W. 1
  Quakertown quadrangle: Bascom, F. 17
Montgomery Co.: Frazer, P. 36; Hall, C.E. 7; Rand, T.D. 11, 17
  Germantown-Norristown quadrangles: Bascom, F. 9
  Quakertown quadrangle: Bascom, F. 17
McKean Co.: Torrey, P.D. 3
Northampton Co.: Behre, C.H. 4; Lesley, J.P. 42; Peck, F.B. 3; Prime, F. 2, 6
  Allentown quadrangle: Miller, B.L. 14
  Hardyston Formation: Miller, B.L. 42; Myers, P.B. 1; Prime, F. 7
  Lehigh Valley: Peck, F.B. 8
Northeastern, anthracite region: Ashburner, C.A. 21
Northern: Swartz, F.M. 23; Taylor, R.C. 5; Torrey, P.D. 3
Northwestern: Fettke, C.R. 30
Pennsylvania: Bassler, R.S. 3; Eaton, A. 2; Grabau, A.W. 5, 6, 15; Hopkins, T.C. 3; Howell, B.F. 5; Hunt, T.S. 3; Kay, G.M. 3; Lesley, J.P. 67; Murdy, R.J. 1; Resser, C.E. 1; Rogers, H.D. 2; Schuchert, C. 3, 23; Ulrich, E.O. 1; Ver Wiebe, W.A. 7; Vicaire, A. 1; Walcott, C.D. 4; Whaley, J.H. 1; Willis, B. 8; Wilson, J.L. 1; Winchell, A. 1
  limestones: Miller, B.L. 18
Philadelphia Co.: Hall, C.E. 7; Lewis, H.C. 32
  Germantown-Philadelphia quadrangles: Bascom, F. 9
  Trenton quadrangle: Bascom, F. 10
Potter Co.: Torrey, P.D. 3
Southeastern: Bascom, F. 8; Foerste, A.F. 1; Frazer, P. 31, 32; Hall, C.E. 6; Hawkins, A.C. 2; Hunt, T.S. 11; Miller, B.L. 23; Rand, T.D. 27; Rogers, H.D. 3, 4, 5; Rogers, W.B. 6; Stose, G.W. 9; Swartz, F.M. 21; Ulrich, E.O. 3; Walcott, C.D. 2, 3, 6, 8; Watson, E.H. 2; Wherry, E.T. 5; Willard, B. 69
  historical review: Hunt, T.S. 9
  Piedmont area: Bascom, F. 8; Mathews, E.B. 1
  resemblance to Scotland: Stose, G.W. 35
  shale: Stose, G.W. 16
Southcentral: Aiken, W.E.A. 1
Southern: Resser, C.E. 2
Southwestern: Lafferty, R.C. 1; Rogers, H.D. 4
Susquehanna Co.: Torrey, P.D. 3
Tioga Co.: Torrey, P.D. 3
Warren Co.: Torrey, P.D. 3
Wayne Co.: Torrey, P.D. 3
Western: Bownocker, J.A. 1; Ver Wiebe, W.A. 5
Wyoming Co., popular: Maxwell, V.L. 1
York Co.: Demming, H.C. 1; Frazer, P. 1, 37; Hickok, W.O. 8; Mathews, E.B. 1; Stose, G.W. 18, 39; Walcott, C.D. 5

- Hanover-York quadrangles: Stose, A.I.J. 1
- McCalls Ferry quadrangle: Knopf, E.F.B. 4; Jonas, A.I. 5
- Middletown quadrangle: Stose, G.W. 33
- *Olenellus* zone: Resser, C.E. 3

CAMERON COUNTY, *see also* Pennsylvania, and Pennsylvania-Western

- *Areal geology*
  - Cameron Co.: Shaefer, A.W. 1
- *Economic geology*
  - coal, bituminous: Sheafer, A.W. 1; Sisler, J.D. 6, 27
  - iron: Ashburner, C.A. 27
  - natural gas: Cathcart, S.H. 10
  - petroleum: Carll, J.F. 4
- *Historical geology*
  - Devonian-Mississippian: Chance, H.M. 5
  - Devonian-Pennsylvanian: Ashburner, C.A. 28; Cathcart, S.H. 10; Shaefer, A.W. 1
- *Maps*
  - Geologic: Lesley, J.P. 46, 47; Shaefer, A.W. 1
  - Structure: Cathcart, S.H. 10
    - fold axes: Ashburner, C.A. 28
- *Physiography*
  - Lake Wright, Pleistocene: Williams, E.H. 13

CANADIAN, *see also* Ordovician

- Central-Southeastern: Ulrich, E.O. 3

CANYONS

- Tioga Co., Susquehanna River, popular: Ashley, G.H. 83

CARBON COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern

- *Areal geology*
  - Jim Thorpe (Mauch Chunk) area: Silliman, B. 3
  - Panther Creek Valley area: Richards, W.B. 1
- *Economic geology*
  - coal, anthracite: Ashley, G.H. 47; LeVan, L.A. 1; Richards, W.B. 1; Rothwell, R.P. 1; Silliman, B. 3; Wasmuth, H.A. 4
    - generalized: Ashburner, C.A. 24
    - Panther Creek field: Ashburner, C.A. 2
  - paint ore: Agthe, F.T. 1; Eckel, E.C. 3; Hesse, C.E. 1; Hill, F.A. 4
  - slate: Behre, C.H. 9
- *Ground water*
  - Carbon Co.: Lohman, S.W. 1
- *Historical geology*
  - Devonian: Prosser, C.S. 3
  - Ordovician-Pennsylvanian: Ashburner, C.A. 24
  - Pennsylvanian
    - Eastern Middle anthracite field: Ashburner, C.A. 18
    - Jim Thorpe area: Silliman, B. 3
    - Panther Creek coal field: Ashburner, C.A. 2; Richards, W.B. 1
  - Silurian, Lehigh water gap: Ashley, G.H. 32
  - Silurian-Devonian, Lehigh water gap: Chance, H.M. 11
  - Silurian-Pennsylvanian: Winslow, A. 2
- *Maps*
  - Economic
    - Mammoth coal: Ashburner, C.A. 2
    - paint ore: Hill, F.A. 4; Miller, B.L. 2
  - Geologic: Lesley, J.P. 46, 63
    - Eastern Middle anthracite field: Ashburner, C.A. 18
    - Lehigh River: Winslow, A. 2
    - Panther Creek coal field: Ashburner, C.A. 2
- *Mineralogy*
  - autunite: Wherry, E.T. 2
  - carnotite: Lawall, C.E. 1; Wherry, E.T. 8, 14
    - popular: Myers, R.E. 1
  - kaolinite: Johnson, S.W. 1
  - quartz: Zodac, P. 1
- *Paleontology*
  - brachiopods, Devonian: Simpson, G.B. 2
  - coral reef, Devonian: Willard, B. 30
  - crinoid, Devonian: Goldring, W. 2
  - Devonian, Onondaga group: Willard, B. 43
  - plants, Pennsylvanian: Brongniart, A. 1; Göppert, J.H.R. 1; White, C.D. 3
- *Petrology*
  - coal, anthracite: Vanuxem, L. 1
- *Physical geology*
  - faults: Brown, E.A. 1
    - anthracite region: Wasmuth, H.A. 4
  - structure
    - anthracite basins: Lyman, B.S. 8
    - Jim Thorpe (Mauch Chunk) area: Ashley, G.H. 47; Rothwell, R.P. 1
    - Lehigh River: Winslow, A. 2
    - Panther Creek coal field: Ashburner, C.A. 2

CARNOTITE, *see also* Radioactive minerals

- Carbon Co.: Lawall, C.E. 1; Wherry, E.T. 8, 14
  - popular: Myers, R.E. 1

CASSINITE, *see* Orthoclase

CATALOGUES
- Pennsylvania fauna: Lesley, J.P. 57
- Pennsylvania Geol. Survey museum: Hall, C.E. 4
  - eurypterids: Mansfield, I.F. 2
  - fossil collections: Simpson, G.B. 1
  - glacial drift materials: Lewis, H.C. 42
  - mineral collection: Genth, F.A. 24
  - oil region: Carll, J.F. 8
  - Perry Co. fossils: Claypole, E.W. 23
  - plants: Lesquereux, L. 17
  - Warren Co. fossils: Randall, F.A. 2
- plants, Schuylkil Co., Pennsylvanian: Unger, C.W. 1

CAVES
- Bedford Co., concretions: Stone, R.W. 32
- Berks Co., Crystal-Onyx caves: Miller, R.L. 6
- Central: Zeller, R.A. 1
  - popular: Zeller, R.A. 2
- Huntingdon Co.: Morganroth, L.C. 1
  - concretions: Stone, R.W. 32
- Lehigh Co.: Faux, F.R. 1; Miller, B.L. 45
  - Lehigh Valley: Miller, B.L. 27
- Mifflin Co., concretions: Stone, R.W. 32
- Monroe Co., Hartman cave: Mercer, H.C. 1
- Montgomery Co., Port Kennedy cave: Mercer, H.C. 2, 3
  - Pleistocene fauna: Heilprin, A. 3
- Northampton Co.: Willard, B. 52
  - Raubsville area: Lyman, B.S. 10
- Pennsylvania: Stone, R.W. 27, 35, 50, 53
  - bone-bearing: Baird, S.F. 1
  - popular: Stone, R.W. 52
  - structural effects: Stone, R.W. 28
- Somerset Co., Shafer Run area: Gorman, J.P. 2

CELESTITE
- Blair Co.: Mügge, O. 1; Young, C.A. 1

CEMENT
- Beaver Co., New Castle quadrangle: De Wolf, F.W. 1
- Bedford Co., Pawpaw quadrangle: Stose, G.W. 12
- Berks Co.: Eckel, E.C. 1
- Bucks Co., Allentown quadrangle: Miller, B.L. 14
- Cambria Co., Johnstown quadrangle: Phalen, W.C. 3
- Fayette Co., Stevenson, J.J. 5
  - Uniontown quadrangle: Campbell, M.R. 1
- Franklin Co.
  - Hancock quadrangle: Stose, G.W. 12
  - Mercersburg quadrangle: Stose, G.W. 10
- Fulton Co., Hancock-Pawpaw quadrangles: Stose, G.W. 12
- Indiana Co., Johnstown quadrangle: Phalen, W.C. 3
- Lawrence Co.: Peck, F.B. 10
  - New Castle quadrangle: De Wolf, F.W. 1
- Lehigh Co.: Eckel, E.C. 1, 4; Miller, B.L. 44; Peck, F.B. 4, 7, 8
  - Allentown quadrangle: Miller, B.L. 14
- Northampton Co.: Eckel, E.C. 1, 4: Miller, B.L. 28; Peck, F.B. 4, 7, 8
  - Allentown quadrangle: Miller, B.L. 14
- Pennsylvania: Burchard, E.F. 1; Eckel, E.C. 2
- Somerset Co., Johnstown quadrangle: Phalen, W.C. 3
- Western: Ashley, G.H. 40
- Westmoreland Co., Johnstown quadrangle: Phalen, W.C. 3

CENOZOIC, *see also* Tertiary and Quaternary
- Lehigh Co.: Miller, B.L. 47
- Northampton Co.: Miller, B.L. 29, 39
- Pennsylvania: Ashley, G.H. 44; Claypole, E.W. 24; Hunt, T.S. 4; Miller, S.A. 1; Nelson, W.A. 1; Rogers, H.D. 25
  - popular: Ashley, G.H. 65
- Southeastern, faulting: Stose, G.W. 25

CENTRE COUNTY, *see also* Pennsylvania, and Pennsylvania-Central
- aeromagnetic survey: Joesting, H.R. 1
- electrical resistivity, Penn's cave: Keller, F. 1
- magnetometer surveys: Pirson, S.J. 1
- meteorites: Keely, F.J. 1
  - popular: Anon. 59
- Nittany Valley, solubility rates: Ewing, A.L. 2
- polylith monument, weathering: Bonine, C.A. 1

Areal geology
- Bellefonte quadrangle: Butts, C. 16; Detrick, W.S. 1
- Centre Co.: D'Invilliers, E.V. 4
- Tyrone quadrangle: Butts, C. 18

Economic geology
- barite, Bellefonte quadrangle: Butts, C. 16
- clay: Moore, E.S. 2, 3
  - Bellefonte quadrangle: Butts, C. 16
  - flint, Sandy Ridge area: Ashley, G.H. 4

- coal, bituminous: D'Invilliers, E.V. 4; Platt, F. 14; Sisler, J.D. 6, 27
- ganister, Tyrone quadrangle: Butts, C. 18
- iron: D'Invilliers, E.V. 3, 4; Lesley, J.P. 20, 28, 43
  - analyses: Genth, F.A. 10, 19
  - Bellefonte quadrangle: Butts, C. 16
  - Tyrone quadrangle: Butts, C. 18
- kaolin: Leighton, H. 7
- lead
  - Bellefonte area, post-Paleozoic: Myers, W.M. 2
  - Bellefonte quadrangle: Butts, C. 16
- limestone: Kay, G.M. 4
  - analyses: Genth, F.A. 10, 19
  - Bellefonte quadrangle: Butts, C. 16
  - Tyrone quadrangle: Butts, C. 18
- marl: Dickey, F.B.R. 1
- silver, Bellefonte quadrangle: Butts, C. 16
- stone
  - Bellefonte quadrangle: Butts, C. 16
  - Tyrone quadrangle: Butts, C. 18
- zinc
  - Bellefonte area, post-Paleozoic: Myers, W.M. 2
  - Bellefonte quadrangle: Butts, C. 16

Ground water

- Tyrone quadrangle: Lohman, S.W. 4

Historical geology

- Cambrian-Ordovician: Brown, T.C. 1
- Cambrian-Mississippian, Tyrone quadrangle: Butts, C. 18
- Cambrian-Pennsylvanian, Bellefonte quadrangle: Butts, C. 16
- Cambrian-Silurian: Krynine, P.D. 10
- Ordovician: Collie, G.L. 1; Kay, G.M. 4; Larson, E.R. 1
  - Bellefonte sandstone: Krynine, P.D. 5
  - Blount group: Butts, C. 15
  - shell conglomerates: Eaton, H.N. 3
- Ordovician-Devonian: Ewing, A.L. 1
- Ordovician-Pennsylvanian: D'Invilliers, E.V. 4; Taylor, R.C. 1
- Silurian: Brown, T.C. 2

Maps

- Economic
  - coal, bituminous, Snow-Shoe coal basin: Platt, F. 1
  - limestone: Swain, F.M. 2
- Geologic: D'Invilliers, E.V. 4; Lesley, J.P. 46, 47
  - Bellefonte quadrangle: Butts, C. 16
  - eastern: D'Invilliers, E.V. 10
  - Tyrone quadrangle: Butts, C. 18

Mineralogy

- fluorite, Bellefonte quadrangle: Butts, C. 16

Paleontology

- algae: Fenton, C.L. 1
- gastropods, Ordovician: Collie, G.L. 1
- nautiloids, Devonian: Miller, A.K. 2
- Ordovician fauna: Collie, G.L. 1
- ostracodes, Ordovician: Collie, G.L. 1; Jones, T.R. 1
- trilobites, Ordovician: Collie, G.L. 1; Raymond, P.E. 5

Petrology

- albite, authigenic: Honess, A.P. 5
- bentonite: Ross, C.S. 1
- concretions, Ordovician: Cathcart, S.H. 1
- conglomerate, organic origin: Brown, T.C. 1; Eaton, H.N. 3
- Nittany dolomite, porosity: Folk, R.L. 1
- oolites
  - Ordovician-Silurian: Brown, T.C. 3
  - origin: Brown, T.C. 1
  - siliceous: Barbour, E.H. 1; Hovey, E.O. 1; Moore, E.S. 1; Wieland, G.R. 1, 2; Ziegler, V. 1
- sandstone, wind-blown origin: Brown, T.C. 1

Physical geology

- concretions, calcareous: Roddy, H.J. 4
- structure: D'Invilliers, E.V. 4; Ewing, A.L. 1

Physiography

- Lake Lesley, Pleistocene: Williams, E.H. 13

CEPHALOPODA

- ammonoids
  - Bedford-Clinton Cos., Devonian: Miller, A.K. 2
  - Erie Co., Devonian: Miller, A.K. 1
  - Lycoming Co., Devonian: Miller, A.K. 2
  - Pennsylvania, Devonian: Miller, A.K. 3
  - Western, Pennsylvanian: Miller, A.K. 5
- Luzerne Co., Pennsylvanian, Mill Creek limestone: Ashburner, C.A. 35
- nautiloids
  - Bradford Co., Devonian: Flower, R.H. 2, 3
  - Central, Ordovician: Richardson, E.S. 1
  - Centre Co., Devonian: Miller, A.K. 2
  - Columbia Co., Silurian: Mook, R.R. 1
  - Cumberland Co., Ordovician: Foerste, A.F. 2
  - Fayette Co., Mississippian: Miller, A.K. 4
  - Huntingdon Co., Mississippian, Pocono Formation: Girty, G.H. 3

  Monroe Co., Devonian: Van Tuyl, F.M. 1
  Northumberland Co., Devonian: Miller, A.K. 2
  Western, Pennsylvanian: Miller, A.K. 5
 Northwestern
  Devonian: Flower, R.H. 1; Caster, K.E. 1
  Mississippian: Caster, K.E. 1
 Pennsylvania, Devonian: Willard, B. 39
 Pike Co., Devonian, Hamilton group: Heilprin, A. 2

CERULEOLACTITE
 Chester Co.: Thomas, C.A. 3

CERUSSITE
 Chester Co.: Rogers, A.F. 1; Smith, L. 1; Thomas, C.A. 8
 Montgomery Co.: Boucot, A.J. 1

CHABAZITE, *see* Zeolites

CHALCOCITE
 Montgomery Co.: Eyerman, J. 1

CHALCOPYRITE
 Chester Co.: Eyerman, J. 2; Penfield, S.L. 1; Smith, J.L. 1; Vaux, G. 2
 Lebanon Co.: Seybert, H. 1; Ulke, T. 1
 Montgomery Co.: Boucot, A.J. 1; Haeberle, W.F. 1
 Northampton Co.: Eyerman, J. 5

CHALCOTRICHITE, *see* Cuprite

CHERT, *see also* Flint, Jasper
 Central, Ordovician: Folk, R.L. 2

CHESTER COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Southeastern

Areal geology
 Chester Co.: Anon. 3; Hartman, W.D. 1; Lesley, J.P. 41
 Coatesville-West Chester quadrangles: Bascom, F. 18
 Doe Run-Avondale area: Bliss, E.F. 2
 Easttown Twp.: Rand, T.D. 16
 Elkton quadrangle: Bascom, F. 13
 Honeybrook-Phoenixville quadrangles: Bascom, F. 21
 McCalls Ferry-Quarryville district: Knopf, E.F.B. 4
 Norristown quadrangle: Bascom, F. 9
 northern: Burke, J.M. 1
 Philadelphia area: Troost, G. 1
 Piedmont district: Bascom, F. 8
 Quarryville quadrangle: Jonas, A.I. 6
 Tredyffrin Twp.: Rand, T.D. 16
 West Chester area: Finch, J. 3

Economic geology
 clay: Ries, H. 5
 chromium: Corbin, J.R. 4; Gordon, S.G. 6; Knopf, E.F.B. 1; Lesley, J.P. 41; Phalen, W.C. 5
 copper: Lesley, J.P. 41; Mason, J.W. 1; Mitchill, T.D. 1
  Norristown quadrangle: Bascom, F. 9
  Phoenixville quadrangle: Bascom, F. 21
 corundum: Leidy, J. 6; Lewis, J.V. 1; Willcox, J. 2
  Unionville area: Pratt, J.H. 1
 feldspar: Ashley, G.H. 24; Bastin, E.S. 1; Hopkins, T.C. 6; Stone, R.W. 29, 47; Watts, A.S. 1; Willcox, J. 2
  Coatesville-West Chester quadrangles: Bascom, F. 18
  Phoenixville quadrangle: Bascom, F. 21
 flint, Phoenixville quadrangle: Bascom, F. 21
 graphite: Beattie, H.M. 1; Frazer, P. 30; Ihne, F.W. 1; Law, E.S. 2; Miller, B.L. 3
  Phoenixville quadrangle: Bascom, F. 21
  Pickering Creek area: Miller, B.L. 41
  Pickering gneiss: Miller, B.L. 4
 gold, Phoenixville area: Corbin, J.R. 6
 iron: Anon. 3; Lesley, J.P. 41
  Coatesville quadrangle: Bascom, F. 18
  French Creek area: Smith, L.L. 2
  Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  Warwick mine area: Spencer, A.C. 2
 kaolin: Hopkins, T.C. 6
  West Chester quadrangle: Bascom, F. 18
 lead: Anon. 3; Blake, W.P. 5; Lesley, J.P. 41; Rogers, H.D. 16; Woodhouse, J. 2
  Norristown quadrangle: Bascom, F. 9
  Phoenixville area: Miller, B.L. 11, 13
  Phoenixville quadrangle: Bascom, F. 21
  Pickering Creek area: Reed, D.F. 2
 limestone: Lesley, J.P. 41
 magnesium: Stone, R.W. 17, 47
 marble: Lesley, J.P. 41
 rutile: Stone, R.W. 47
 sand, Honeybrook-Phoenixville quadrangles: Bascom, F. 21
 silver: Blake, W.P. 5
 stone
  Coatesville quadrangle: Bascom, F. 18
  Elkton quadrangle: Bascom, F. 13
  Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  Norristown quadrangle: Bascom, F. 9

- zinc: Woodhouse, J. 2
  - Phoenixville area: Miller, B.L. 11, 13
  - Phoenixville quadrangle: Bascom, F. 21
  - Pickering Creek area: Reed, D.F. 2

Ground water
- Coatesville-West Chester quadrangles: Bascom, F. 18
- Elkton quadrangle: Bascom, F. 13
- Philadelphia district: Bascom, F. 7
- well log: Lesley, J.P. 62

Historical geology
- Cambrian-Ordovician: Abbey, M.B. 1; Stose, G.W. 18
- Ordovician, Conestoga limestone: Jonas, A.I. 14
- Precambrian: Frazer, P. 30; Willig, E.S. 1
  - schists: Rand, T.D. 19
  - Wissahickon Formation: Dike, P.A. 1
- Precambrian-Ordovician: Hawkins, A C. 2; Jonas, A.I. 2
  - Quarryville quadrangle: Jonas, A.I. 6; Knopf, E.F.B. 4
- Precambrian-Tertiary, Norristown quadrangle: Bascom, F. 9
- Precambrian-Triassic: Bliss, E.F. 2; Hartman, W.D. 1; Lesley, J.P. 41
  - Coatesville-West Chester quadrangles: Bascom, F. 18
  - Honeybrook-Phoenixville quadrangles: Bascom, F. 21
- Tertiary: Chester, A.H. 1

Maps
- Economic
  - feldspar: Bastin, E.S. 1; Stone, R.W. 29
  - graphite: Phoenixville area: Miller, B.L. 3
- Geologic: Anon. 3; Hartman, W.D. 1; Lesley, J.P. 41, 46, 47
  - Coatesville-West Chester quadrangles: Bascom, F. 18
  - Doe Run-Avondale area: Bliss, E.F. 2
  - Easttown Twp.: Rand, T.D. 16
  - Elkton quadrangle: Bascom, F. 13
  - French Creek area: Smith, L.L. 2
  - Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  - Honeybrook uplift: Stose, G.W. 37
  - McCalls Ferry-Quarryville district: Knopf, E.F.B. 4
  - Philadelphia area: Troost, G. 1
  - Phoenixville mining district: Miller, B.L. 13
  - Quarryville quadrangle: Jonas, A.I. 6
  - Tredyffrin Twp.: Rand, T.D. 16
  - Warwick mine area: Spencer, A.C. 2
- Isograd, Glenarm Series: McKinstry, H.E. 4
- Structure, Coatesville-West Chester quadrangles: Bascom, F. 18

Mineralogy
- albite: Silliman, B., Jr. 3
- allanite: Lea, I. 16; Rammelsberg, K.F. 1; Wherry, E.T. 2
- allite: Silliman, B., Jr. 4
- amethyst: Jefferies, W.W. 2
- anglesite: Lang, V. 1; Smith, J.L. 1; Thomas, C.A. 8
- anthophyllite: Genth, F.A. 14; Vaux, G. 2
- apatite: Seybert, H. 1; Wherry, E.T. 23
- apophyllite: Eyerman, J. 1, 2; Knerr, E.B. 1; Thomas, C.A. 9
- aquacreptite: Shepard, C.U. 4
- asbefferite: Goldsmith, E. 1
- azurite: Smith, J.L. 1
- beryl: Seal, T. 1; Stone, R.W. 47
- Brintons quarry: McKinstry, H.E. 1
- byssolite: Vaux, G. 2
- calamine: Smith, J.L. 1
- calcite: Eyerman, J. 2; Gordon, S.G. 10; Smith, J.L. 1; Vaux, G. 2
- ceruleolactite: Thomas, C.A. 3
- cerussite: Rogers, A.F. 1; Smith, J.L. 1; Thomas, C.A. 8
- chalcopyrite: Eyerman, J. 2; Penfield, S.L. 1; Smith, J.L. 1; Vaux, G. 2
- chesterlite: McKinstry, H.E. 2; Smith, J.L. 1
- chesterlite-talc: Smith, J.L. 1
- chlorite: Clarke, F.W. 2
  - magnetite-bearing: Dana, J.D. 2
- chromite: Garrett, T.H. 1; Seybert, A. 4
- clinochlore: Blake, W.P. 1; Clarke, F.W. 1; Cooke, J.P. 1; Craw, W.J. 1; Klein, C. 1; Neminarz, E.F. 1; Pennypacker, C.H. 3
- colerainite: Shannon, E.V. 1
- copper: Smith, J.L. 1
- corundellite: Hermann, R. 3; Silliman, B., Jr. 3
- corundum: Genth, F.A. 9; Jefferies, W.W. 1; Lea, I. 15; McKinstry, H.E. 3; Pennypacker, C.H. 2; Willcox, J. 1
- delawarite: Lea, I. 14
- descloizite: Smith, J.L. 1
- diaspore: Dana, E.S. 2; Lea, I. 15
- dolomite (ankerite): Koenig, G.A. 2
- emerylite: Hermann, R. 3; Smith, J.L. 1
- erythite: Lewis, H.C. 39
- euphyllite: Hermann, R. 3; Silliman, B., Jr. 3; Smith, J.L. 1
- feldspar: Hopkins, T.C. 5; Lea, I. 14
- fluorite: Jefferies, W.W. 3; Smith, J.L. 1; Whitlock, H.P. 1

French Creek area: Chamberlin, B.B. 1
fuchsite: Wherry, E.T. 17
galena: Smith, J.L. 1
  argentiferous: Blake, W.P. 2
garnet: Jefferies, W.W. 4; Vaux, G. 2
gems: Taber, T. 1
gibbsite: Hermann, R. 5
glauconite: Knerr, E.B. 1
hallite: Clarke, F.W. 2; Cooke, J.P. 2; Leeds, A.R. 4
hydrargillite: Seal, T. 2
jefferisite: Brush, G.J. 2; Cooke, J.P. 2
kerolite: Smith, J.L. 1
kyanite: Stone, R.W. 47
lesleyite: Lea, I. 15; Smith, J.L. 2
limonite: Smith, J.L. 1; Thomas, C.A. 3
malachite: Smith, J.L. 1
margarite: Smith, J.L. 1
mica: Leeds, A.R. 8
  crystal inclusions: Rand, T.D. 13
mimetime: Smith, J.L. 1
mineral collecting: Benge, E. 2; Carpenter, G.W. 2, 3; Finch, J. 3; Lea, I. 1; McKinstry, H.E. 1; Rand, T.D. 21
molybdenite: Carendeffez, B. 1
muscovite: Lewis, H.C. 31
oligoclase: Smith, J.L. 1
orthoclase: Eyerman, J. 2; Genth, F.A. 22; Smith, J.L. 1
  (cassinite): Lea, I. 14
painterite: Clarke, F.W. 2
pattersonite: Lea, I. 15
prehnite: Thomas, C.A. 9
pyrite: Eyerman, J. 1, 2; Vaux, G. 2; Wherry, E.T. 26
  cobalt-bearing: Genth, F.A. 26
pyromorphite: Lewis, T.J. 2; Smith, J.L. 1; Thomas, C.A. 8
quartz: Groth, E.A. 1; Thomas, C.A. 3, 8
  serpentine-derived: Rand, T.D. 8
  pseudomorphs: Vaux, G. 1
scapolite: Genth, F.A. 26; Tomlinson, W.H. 5
serpentine: Sharples, S.P. 1; Thomas, C.A. 3; Wherry, E.T. 23
sphalerite: Smith, J.L. 1
stilbite: Eyerman, J. 2
sulphur: Smith, J.L. 1
sunstone: Lea, I. 14
Swarthmore quarry: Borden, H.C. 1
titanite: Bruce, A. 1
tourmaline: Lea, I. 15
unionite: Silliman, B., Jr. 1; Smith, J.L. 1
vermiculite: Clarke, F.W. 2
wavellite: Gordon, S.G. 8; Hermann, R. 5
white chlorite: Shannon, E.V. 1
williamsite: Hermann, R. 2
wulfenite: Koch, S. 1; Schrauf, A. 1; Smith, J.L. 1; Wetherill, C.M. 2
zeolite: Eyerman, J. 6
zincite: Thomas, C.A. 4
zoisite: Wherry, E.T. 23

Paleontology
amphibians, Triassic: Huene, F. von 1
coprolite, Triassic: Lea, I. 11
fish, Triassic: Lea, I. 10; Leidy, J. 4, 5; Lewis, H.C. 35
fossil (?) cast: Cardeza, J.M. 1
ostracodes, Triassic: Leidy, J. 5
pelecypods, Triassic: Lea, I. 10; Leidy, J. 4, 5; Lewis, H.C. 35; Richards, H.G. 2
  Lockatong shale: Conrad, T.A. 4
plants, Triassic: Leidy, J. 5; Lewis, H.C. 35
reptiles, Triassic: Cope, E.D. 1, 3, 6; Heune, F. von 1; Lea, I. 10, 11; Leidy, J. 5; Lewis, H.C. 35
tracks, Triassic: Lea, I. 10
Triassic fauna: Lesley, J.P. 41
  Lockatong Formation: Wheatley, C.M. 1

Petrology
albitite: Gordon, S.G. 3; Larsen, E.S. 1
anorthosite: Smith, I.F. 2
basic rocks, State Line serpentine belt: Chester, F.D. 2
corundum: Larsen, E.S. 1
diabase: Rand, T.D. 24
Glenarm series, mineral isograds: McKinstry, H.E. 4
granodiorite, hydrothermal origin: Postel, A.W. 4
hornblende gneiss, alteration: Postel, A.W. 1
Octoraro phyllite: Boudreau, E. 1
phonolite: Goldsmith, E. 1; Rand, T.D. 24
plumasite: Gordon, S.G. 3
serpentine
  origin: Frazer, P. 34
  State Line area: Chester, F.D. 2
steatite: Rand, T.D. 22
Wissahickon schist, heavy minerals: Copeland, M.J. 1
zircon, Honeybrook uplift: Dryden, A.L. 4

Physical geology
anticline, fork-tongued: Lesley, J.P. 5
faulted folds: Stose, G.W. 20
faulting, Triassic: McLaughlin, D.B. 4
metamorphism: Lewis, H.C. 41
structure, Honeybrook uplift: Stose, G.W. 37
Woodville anticline, recumbent: Bailey, E.B. 1

Physiography
terraces, high-level: Lesley, J.P. 33

CHLORITE
Chester Co.: Clarke, F.W. 2; Dana, J.D. 2
Luzerne Co.: Northup, M.A. 3
white, Chester Co.: Shannon, E.V. 1

CHLOROPAL
Lebanon Co.: Eyerman, J. 1
Lehigh Co.: Smith, E.F. 2

CHROMIUM
Chester Co.: Garrett, T.H. 1; Gordon, S.G. 6; Knopf, E.F.B. 1; Lesley, J.P. 41; Phalen, W.C. 5; Seybert, A. 4
Delaware Co.: Phalen, W.C. 5; Rand, T.D. 9; Willcox, J. 2
Lancaster Co.: Dieffenbach, O. 1; Diller, J.S. 1; Frazer, P. 29; Glenn, W. 1; Gordon, S.G. 6; Jonas, A.I. 6; Knopf, E.F.B. 1; McIntosh, F.K. 1; Phalen, W.C. 5; Sampson, E. 1
popular: Foose, R.M. 10; Stone, R.W. 51
Philadelphia Co.: Carpenter, G.W. 1
Southeastern: Ashley, G.H. 76; Corbin, J.R. 4; Fisher, L.E. 1

CHRYSOCOLLA
Lebanon Co.: Smith, S. 1
Montgomery Co.: Boucot, A.J. 1

CHRYSOTILE, *see also* Asbestos
Lebanon Co.: Eyerman, J. 1

CLARION COUNTY, *see also* Pennsylvania, and Pennsylvania-Western
meteorite, error: Stone, R.W. 37

Areal geology
Brookville quadrangle: Graeber, C.K. 2, 3
Clarion Co.: Chance, H.M. 6
Clarion-Foxburg quadrangles: Shaw, E.W. 4
Kittanning quadrangle: Butts, C. 3
Oil City quadrangle: Dickey, P.A. 4
Rural Valley quadrangle: Butts, C. 5

Economic geology
clay: Ries, H. 5
Brookville quadrangle: Graeber, C.K. 3
Clarion quadrangle: Lines, E.F. 1; Shaw, E.W. 4
Foxburg quadrangle: Shaw, E.W. 4
Kittanning quadrangle: Butts, C. 3, 6
Rural Valley quadrangle: Butts, C. 5, 6
coal, bituminous: Chance, H.M. 6; Sisler, J.D. 7, 27
Brookville quadrangle: Graeber, C.K. 3
Clarion quadrangle: Lines, E.F. 2; Shaw, E.W. 4
Foxburg quadrangle: Shaw, E.W. 2, 4
Kittanning quadrangle: Butts, C. 3, 6
reserves: Sisler, J.D. 22
Rural Valley quadrangle: Butts, C. 5, 6
iron: Chance, H.M. 6
Brookville quadrangle: Graeber, C.K. 3
Clarion-Foxburg quadrangles. Shaw, E.W. 4
Kittanning quadrangle: Butts, C. 3, 6
Rural Valley quadrangle: Butts, C. 5, 6
limestone
Clarion-Foxburg quadrangles: Shaw, E.W. 4
Kittanning quadrangle: Butts, C. 3, 6
Rural Valley quadrangle: Butts, C. 5, 6
natural gas
Brookville quadrangle: Graeber, C.K. 3
Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4
Foxburg quadrangle: Shaw, E.W. 2, 4
Kittanning quadrangle: Butts, C. 3, 6
Oil City quadrangle: Dickey, P.A. 4, 5
Rural Valley quadrangle: Butts, C. 5, 6
petroleum: Chance, H. M. 6
Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4
Foxburg quadrangle: Shaw, E.W. 2, 4
Kittanning quadrangle: Butts, C. 3, 6
Oil City quadrangle: Dickey, P.A. 4, 5
Rural Valley quadrangle: Butts, C. 5, 6
sand, Kittanning quadrangle: Butts, C. 3
sandstone, Clarion-Foxburg quadrangles: Shaw, E.W. 4
shale
Brookville quadrangle: Graeber, C.K. 3
Clarion quadrangle: Lines, E.F. 1; Shaw, E.W. 4
Foxburg quadrangle: Shaw, E.W. 4
Kittanning quadrangle: Butts, C. 3, 6

    - Rural Valley quadrangle: Butts, C. 6
  - stone
    - Kittanning quadrangle: Butts, C. 3, 6
    - Rural Valley quadrangle: Butts, C. 6
- *Ground water*
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion Co.: Leggette, R.M. 1
- *Historical geology*
  - Devonian-Mississippian: Chance, H.M. 5; Lucas, D.J. 1
    - Oil City quadrangle: Dickey, P.A. 5
  - Devonian-Pennsylvanian
    - Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4
    - Foxburg quadrangle: Shaw, E.W. 2, 4
    - Kittanning quadrangle: Butts, C. 3
    - Oil City quadrangle: Dickey, P.A. 4
  - Mississippian-Pennsylvanian: Chance, H.M. 6
    - Brookville quadrangle: Graeber, C.K. 3
  - Mississippian-Pleistocene, Rural Valley quadrangle: Butts, C. 5
  - Pennsylvanian
    - Brookville quadrangle: Graeber, C.K. 3
    - Clarion quadrangle: Lines, E.F. 2
- *Maps*
  - Economic
    - Brookville quadrangle, mineral resources: Graeber, C.K. 3
    - Clarion-Foxburg quadrangles, mineral resources: Shaw, E.W. 4
    - coal, bituminous, Foxburg quadrangle: Shaw, E.W. 2
    - Kittanning quadrangle, mineral resources: Butts, C. 3, 6
    - natural gas, Oil City quadrangle: Dickey, P.A. 5
    - petroleum: Carll, J.F. 3; Lesley, J.P. 51
      - Clarion quadrangle: Munn, M.J. 3
      - Oil City quadrangle: Dickey, P.A. 5
    - petroleum and gas
      - Clarion quadrangle: Shaw, E.W. 4
      - Foxburg quadrangle: Shaw, E.W. 2, 4
    - Rural Valley quadrangle, mineral resources: Butts, C. 5, 6
  - Geologic: Carll, J.F. 3; Chance, H.M. 6; Lesley, J.P. 46, 47
    - Brookville quadrangle: Graeber, C.K. 3
    - Clarion quadrangle: Shaw, E.W. 4
    - Foxburg quadrangle: Shaw, E.W. 2, 4
    - Kittanning quadrangle: Butts, C. 3, 6
    - Rural Valley quadrangle: Butts, C. 5, 6
  - Structure: Lesley, J.P. 51
  - Structure contour
    - Brookville quadrangle, Catskill sandstone, Devonian: Graeber, C.K. 3
    - Clarion quadrangle
      - Lower Kittanning coal: Munn, M.J. 3
      - Vanport limestone, Pennsylvanian: Shaw, E.W. 4
    - Foxburg quadrangle, Vanport limestone, Pennsylvanian; Shaw, E.W. 2, 4
    - Kittanning quadrangle, Vanport limestone, Pennsylvanian: Butts, C. 3, 6
    - Oil City quadrangle, Devonian sands: Dickey, P.A. 4
    - Rural Valley quadrangle, Vanport limestone, Pennsylvanian: Butts, C. 5, 6
    - Vanport limestone, Pennsylvanian: Graeber, C.K. 2
- *Petrology*
  - natural briquettes: Schopf, J.M. 2
- *Physical geology*
  - structural trends: Sisler, J.D. 7
  - structure: Chance, H.M. 6
    - Clarion quadrangle: Munn, M.J. 3
- *Physiography*
  - abandoned channels: Williams, E.H. 11
  - drainage changes
    - Allegheny River: Chance, H.M. 6; Williams, E.H. 11
    - Clarion River: Chance, H.M. 6
  - glacial geology, Foxburg quadrangle: Shaw, E.W. 4
  - glacial gravel: Leverett, F. 2

CLAY, *see also* Fire clay and individual clay minerals
  - Adams Co.: Stose, G.W. 21
  - Allegheny Co.
    - Beaver quadrangle: Woolsey, L.H. 3, 4
    - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
    - Freeport quadrangle: Hughes, H.H. 1
    - Pittsburgh quadrangle: Johnson, M.E. 9
    - Sewickley quadrangle: Munn, M.J. 5
  - Armstrong Co.
    - Brookville quadrangle: Graeber, C.K. 3
    - Clarion quadrangle: Shaw, E.W. 4
    - Elders Ridge quadrangle: Stone, R.W. 3, 5
    - Freeport quadrangle: Hughes, H.H. 1
    - Kittanning quadrangle: Butts, C. 3

  - Rural Valley quadrangle: Butts, C. 5, 6
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Beaver Co.: Mansfield, I.F. 3; Woolsey, L.H. 1
  - analyses: McCreath, A.S. 2
  - Beaver quadrangle: Woolsey, L.H. 3, 4
  - Burgettstown quadrangle: Shaw, E.W. 3
  - New Castle quadrangle: De Wolf, F.W. 1
  - Sewickley quadrangle: Munn, M.J. 5
  - Zelienople quadrangle: Richardson, G.B. 12
- Bedford Co.
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Blair Co.: Moore, E.S. 2, 3
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg quadrangle: Butts, C. 20
  - Patton quadrangle: Campbell, M.R. 8
- Bucks Co.
  - Allentown quadrangle: Miller, B.L. 14
  - Easton quadrangle: Bayley, W.S. 2
- Butler Co.
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E. W. 4
  - Kittanning quadrangle: Butts, C. 3, 6
  - Sewickley quadrangle: Munn, M.J. 5
- Cambria Co.: Ries, H. 5
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Ebensburg quadrangle: Butts, C. 4
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - southwest: Phalen, W.C. 1
- Central, alumina-rich underclay: Sanford, R.S. 1
- Centre Co.: Moore, E.S. 2, 3
  - Bellefonte quadrangle: Butts, C. 16
  - Sandy Ridge area, flint: Ashley, G.H. 4
- Chester Co.: Ries, H. 5
- Clarion Co.: Ries, H. 5
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Lines, E.F. 1; Shaw, E.W. 4
  - Foxburg quadrangle: Shaw, E.W. 4
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
- Clearfield Co.: Bolger, R.C. 1; Chance, H.M. 14
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Curwensville quadrangle: Ashley, G.H. 68
  - flint: Ashley, G.H. 4
  - high-alumina: Foose, R.M. 13
  - Punxsutawney quadrangle: Ashley, G.H. 33
- Clinton Co., diaspore: Foose, R.M. 16
- Cumberland Co.: Ries, H. 5; Stone, R.W. 8
  - Mt. Holly Springs area: Foose, R.M. 11
- Dauphin Co., Middletown quadrangle: Stose, G.W. 33
- Delaware Co.: Ries, H. 5
- Fayette Co.: Hickok, W.O. 10; Leighton, H. 9; Stevenson, J.J. 5
  - Accident-Grantsville quadrangles: Martin, G.C. 3
  - Masontown-Uniontown quadrangles: Campbell, M.R. 1
  - Waynesburg quadrangle: Stone, R.W. 4
- Franklin Co., Chambersburg quadrangle: Stose, G.W. 10
- Greene Co.: Stevenson, J.J. 3; Stone, R.W. 33
  - Amity quadrangle: Clapp, F.G. 4, 6
  - Claysville quadrangle: Munn, M.J. 7
  - Masontown quadrangle: Campbell, M.R. 1
  - Waynesburg quadrangle: Stone, R.W. 4
- Huntingdon Co.: Leighton, H. 7; Moore, E.S. 2, 3
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Indiana Co.
  - Barnesboro quadrangle: Campbell, M.R. 8
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Indiana quadrangle: Richardson, G.B. 2
  - Johnstown quadrangle: Phalen, W. C. 3, 4
  - Latrobe quadrangle: Campbell, M.R. 6
  - northeastern, flint: Ashley, G.H. 4
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Jefferson Co.
  - Brookville quadrangle: Graeber, C.K. 3
  - Punxsutawney quadrangle: Ashley, G.H. 33

    Smicksburg quadrangle: Shaffner, M.N. 3
  Lancaster Co.: Ries, H. 5
    Lancaster quadrangle: Jonas, A.I. 10
    New Holland quadrangle: Jonas, A.I. 7
  Lawrence Co.
    New Castle quadrangle: De Wolf, F.W. 1
    Zellenople quadrangle: Richardson, G.B. 12
  Lehigh Co.: Miller, B.L. 44
    Allentown quadrangle: Miller, B.L. 14
  Lycoming Co.: Hodge, J.T. 2
  McKean Co.: Ashburner, C.A. 14
  Monroe Co.: Ries, H. 5
    Saylarsburg area: Peek, F.B. 9
  Montgomery Co.: Carter, O.C.S. 1; Hopkins, T.C. 8
  Northampton Co.: Miller, B.L. 28
    Allentown quadrangle: Miller, B.L. 14
    Easton-Delaware Water Gap quadrangles: Bayley, W.S. 2
  Pennsylvania: Ashley, G.H. 76; Hice, R.R. 9; Hudson, F. 1; Leighton, H. 10; Lovejoy, E. 1; Ries, H. 1, 2, 4
    analyses: McCreath, A.S. 3
    firebrick material: Ashley, G.H. 30
    origin: Hopkins, T.C. 11
  Perry Co.: Claypole, E.W. 16
  Somerset Co.: Johnson, W.R. 9
    Accident quadrangle: Martin, G.C. 3
    Johnstown quadrangle: Phalen, W. C. 3, 4
    Windber quadrangle: Richardson, G.B. 11
  Southeastern: Hopkins, T.C. 4, 10; Ries, H. 3
  Southwestern: Leighton, H. 5; Peehin, E.C. 1; Stone, R.W. 9
  Tioga Co.
    Bradford sand, composition: Bates, T.F. 1
    Tioga quadrangle: Fuller, M.L. 3
  Venango Co., Foxburg quadrangle: Shaw, E.W. 4
  Warren Co.: Carll, J.F. 4
    Warren quadrangle: Butts, C. 11
  Washington Co.: Stevenson, J.J. 3
    Amity quadrangle: Clapp, F.G. 4, 6
    Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
    Claysville quadrangle: Munn, M.J. 7
    Masontown quadrangle: Campbell, M.R. 1
    Pittsburgh quadrangle: Johnson, M.E. 9
    Waynesburg quadrangle: Stone, R.W. 4
  Western: Ashley, G.H. 40; Hice, R.R. 3; Hopkins, T.C. 4; Leighton, H. 4
  Westmoreland Co.: Stevenson, J.J. 5
    Freeport quadrangle: Hughes, H.H. 1
    Greensburg quadrangle: Johnson, M.E. 8
    Johnstown quadrangle: Phalen, W.C. 3, 4
    Latrobe quadrangle: Campbell, M.R. 6
    Pittsburgh quadrangle: Johnson, M.E. 9
  York Co: Stose, G.W. 39
    Hanover-York area: Stose, A.I.J. 1

CLAY VEINS
  Fayette Co.: Price, P.H. 2
  Western: Gresley, W.S. 7

CLEARFIELD COUNTY, *see also* Pennsylvania, and Pennsylvania-Western
  aeromagnetic survey: Joesting, H. R. 1
  magnetometer surveys: Pirson, S.J. 1

Areal geology
  Barnesboro-Patton quadrangles: Campbell, M.R. 8
  Clearfield Co.: Chance, H.M. 14
  Curwensville quadrangle: Ashley, G.H. 68
  Punxsutawney quadrangle: Ashley, G.H. 33

Economic geology
  aluminum, popular: Foose, R.M. 10
  clay: Bolger, R.C. 1; Chance, H.M. 14
    Barnesboro-Patton quadrangles: Campbell, M.R. 8
    Curwensville quadrangle: Ashley, G.H. 68
    flint, Pennsylvanian: Ashley, G.H. 4
    high-alumina: Foose, R.M. 13
    Punxsutawney quadrangle: Ashley, G.H. 33
  coal, bituminous: Ashley, G.H. 3, 48; Chance, H.M. 14; Johnson, W.R. 2; Kemp, J.F. 4; Platt, F. 1
    Barnesboro-Patton quadrangles: Campbell, M.R. 8
    Curwensville quadrangle: Ashley, G.H. 68
    Punxsutawney quadrangle: Ashley, G.H. 33
    reserves: Reese, J.F. 5
  coal, cannel: Ashley, G.H. 1
  fire clay: Platt, F. 1
  iron: Chance, H.M. 14; Johnson, W.R. 2; Platt, F. 1
  limestone: Chance, H.M. 14; Johnson, W.R. 2
    Barnesboro-Patton quadrangles: Campbell, M.R. 8

  - Curwensville quadrangle: Ashley, G.H. 68
  - Punxsutawney quadrangle: Ashley, G.H. 33
- natural gas
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Punxsutawney quadrangle: Ashley, G.H. 33
- petroleum, Punxsutawney quadrangle: Ashley, G.H. 33
- sandstone
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Curwensville quadrangle: Ashley, G.H. 68
  - Punxsutawney quadrangle: Ashley, G.H. 33
- shale
  - Curwensville quadrangle: Ashley, G.H. 68
  - western: Ashley, G.H. 4

Ground water

- Barnesboro-Patton quadrangles: Clapp, F.G. 2
- Curwensville quadrangle: Ashley, G.H. 68; Clapp, F.G. 2

Historical geology

- Devonian-Pennsylvanian, Curwensville quadrangle: Ashley, G.H. 68
- Pennsylvanian: Ashley, G.H. 48; Chance, H.M. 14; Hale, J.M. 1; Kemp, J.F. 1
  - Allegheny Formation: Platt, F. 1
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Punxsutawney quadrangle: Ashley, G.H. 33

Maps

- Economic
  - Barnesboro-Patton quadrangles, mineral resources Campbell, M.R. 8
  - Curwensville quadrangle, mineral resources: Ashley, G.H. 68
  - Punxsutawney quadrangle, mineral resources: Ashley, G.H. 33
  - Steam-coal basin: Platt, F. 1
- Geologic: Chance, H.M. 14; Lesley, J.P. 46, 47
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Curwensville quadrangle: Ashley, G.H. 68
  - Punxsutawney quadrangle: Ashley, G.H. 33
- Structure, anticlinal axes: Platt, F. 1
- Structure contour
  - Barnesboro-Patton quadrangles, Lower Freeport coal: Ashley, G.H. 10; Campbell, M.R. 8
  - Curwenvsille-Punxsutawney quadrangles, Lower Freeport coal: Ashley, G.H. 10

Mineralogy

- fire clay, iron content: Leatham, E. 1

Physical geology

- structure
  - Barnesboro-Patton quadrangles: Ashley, G.H. 10
  - Curwensville-Punxsutawney quadrangles: Ashley, G.H. 10

CLEAVAGE

- Appalachian Mtns: Rogers, H.D. 11
- Bedford Co., relation to bedding: Foose, R.M. 12
- Lancaster Co., Chiques Rock: Foose, R.M. 18

CLINOCHLORE

- Chester Co.: Blake, W.P. 1; Clarke, F.W. 1; Cooke, J.P. 1; Craw, W.J. 1; Klein, C. 1; Neminarz, E.F. 1; Pennypacker, C.H. 3
- (kotschubeite), Lancaster Co.: Tschermak, G. 1
- Lancaster Co.: Cooke, J.P. 1; Koksсharov, N., von 1; Tschermak, G. 1
- (ripidolite), Lebanon Co.: Eyerman, J. 1

CLINTON COUNTY, *see also* Pennsylvania, Pennsylvania-Central, and Pennsylvania-Western

Areal geology

- Clinton Co.: Chance, H.M. 7

Economic geology

- aluminum, diaspore: Foose, R.M. 16
- coal, bituminous: Chance, H.M. 7; Leeds, S.P. 1; Platt, F. 13, 14; Sisler, J.D. 6, 27
  - Karthouse coal basin: Harvey, I.A. 1
  - Renovo coal basin: Ashburner, C.A. 13
  - Westport area: Chance, H.M. 16
- fire clay: Platt, F. 13
- iron: Chance, H.M. 7
- limestone: Kay, G.M. 4
- natural gas: Fuller, M.L. 5; Johnson, M.E. 3

Historical geology

- Cambrian-Pennsylvanian: Chance, H.M. 1
- Devonian: Johnson, M.E. 3
  - Chemung Formation: Willard, B. 14
- Devonian-Mississippian: Chance, H.M. 5
- Devonian-Pennsylvanian: Chance, H.M. 2

Ordovician: Kay, G.M. 4
  Trenton limestone: Whitcomb, L. 3
Ordovician-Pennsylvanian: Chance, H.M. 7
Ordovician-Pleistocene: Ulmer, L.J. 1
Pennsylvanian: Leeds, S.P. 1
  Renovo coal basin: Ashburner, G.H. 13

Maps
  Economic, limestone: Swain, F.M. 2
  Geologic: Chance, H.M. 7; Lesley, J.P. 46, 47

Paleontology
  ammonoids, Devonian: Miller, A.K. 2
  brachiopods, Ordovician: Cooper, G.A. 2
  Devonian, Chemung Formation: Willard, B. 14
  trilobite, Ordovician: Whitcomb, L. 1

Physical geology
  structure: Chance, H.M. 7
  syncline, across Appalachian structure: Foose, R.M. 3

Physiography
  Lake Lesley, Pleistocene: Williams, E.H. 13

COAL
  Montgomery Co., Triassic: Carter, O.C.S. 6
    Norristown quadrangle: Bascom, F. 9
  Pennsylvania: Anon. 2; Ashley, G.H. 76; Bowen, E. 1, 4; Boyd, C.R. 1; Burrows, J.S. 2; Campbell, M.R. 11, 12; Daddow, S.H. 1; Eaton, A. 1; Hayes, C.W. 1; Hitchcock, C.H. 4, 7; Hoeffer, H. 1; Lesley, J.P. 1; Logan, W.E. 1; Macfarlane, J. 1, 2; Parker, E.W. 1; Pierce, J. 1; Plotts, W. 1, 3; Prime, F. 8; Roy, A. 1; Rogers, H.D. 10; Taylor, R.C. 10; Wethered, E. 1
    analyses: Land, N.W. 1
    anthracite-bituminous contemporaneity: Johnson, W.R. 10
    classification: Frazer, P. 16
    low-sulphur: Chance, H.M. 19
    origin: Lesquereux, L. 6; Stevenson, J.J. 22; Willard, B. 66
    popular: Andrews, E.B. 3; Nicolls, W.J. 1; Sheafer, P.W. 7
    rate of deposition: Ashley, G.H. 6
    relation to oil and gas: Ashley, G.H. 19
    reserves: Kuhn, O.R. 1
    structural distortion: Wasmuth, H.A. 3
    total thickness: Ashley, G.H. 5
    volatile content: Sisler, J.D. 20
  Wayne Co., Devonian: Beck, T.R. 1

anthracite
  Carbon Co.: LeVan, L.A. 1; Richards, W.B. 1; Rothwell, R.P. 1; Silliman, B. 3; Vanuxem, L. 1; Wasmuth, H.A. 4
    generalized: Ashburner, C.A. 24
    Panther Creek field: Ashburner, C.A. 2
  Dauphin Co.: Johnson, W.R. 8; Lea, I. 5; Wasmuth, H.A. 4
    analyses: Johnson, W.R. 7
    crystalloid: Johnson, W.R. 6
    westward bituminization: Lea, M.C. 1
  Eastern, river-borne: Hills, J.M. 1; Webbert, C.W. 1
  Lackawanna Co.: Gleason, F.A. 1; Griffith, W. 3; Hill, F.A. 2; Rogers, H.D. 18; Silliman, B. 4
  Lehigh Co., westward bituminization: Lea, M.C. 1
  Luzerne Co.: Cist, Z. 2; Foote, F.W. 1; Gleason, F.A. 1; Gross, L.M. 1; Hill, F.A. 2; Johnson, W.R. 1; Joyce, W.E. 1; Silliman, B. 4; Wasmuth, H.A. 5
    analyses: Johnson, W.R. 3
    spheroidal weathering: Gresley, W.S. 1
  Northampton Co.: Johnson, W.R. 1
  Northeastern: Ashburner, C.A. 18, 19, 21, 22, 25, 36; Austin, A.C. 1; Caddell, H.M. 1; Green, W. 1; Griffith, W. 2, 4; Haetter, J.H. 1; Hill, F.A. 3; Lyell, C. 2; Meade, W. 1; Parker, E. W. 2; Rogers, H.D. 5, 8, 14; Rothrock, H. E. 1; Silliman, B. 2; Smith, A. deW. 1, 2; Stock, H.H. 2; Storrs, A.H. 1; Taylor, R.C. 8; Thomas, J.P. 1
    analyses: Johnson, W.R. 5; McCreath, A.S. 3
    correlation: Turner, H.G. 2
    general: Ashburner, C.A. 20; Campbell, M.R. 13, 15
    limits: Althouse, H.W. 3
    origin: Ashley, G.H. 20; Gresley, W.S. 6; Hardman, E. T. 1; Jeffery, E.C. 2; Stevenson, J.J. 15
    phosphorous content: Britton, J.B. 1
    wood-bearing: Bunker, J.M. 1
  Northumberland Co.: Rogers, H.D. 20
  petrography: Turner, H.G. 1
  Philadelphia Co., river silt: Leidy, J. 10
  popular: Bowen, E. 2; Maxwell, V.L. 1
  reserves: Ashley, G.H. 18, 61, 77; Ashmead, D.C. 1
  Schuylkill Co.: Coxe, E.B. 1; Johnson, W.R. 1; Koehler, H. 1; Lea, I. 2; LeVan, L.A. 1; Parsons, F.W. 1;

  Richards, W.B. 1; Sheaffer, P.W. 4
  bacteria: Turner, H.G. 3
  Buck Mtn. coal field: Althouse, H.W. 2
  Moorea-New Boston area: Lyman, B.S. 2
  Panther Creek coal field: Ashburner, C.A. 2
  Shippen-Wetherill coal tract: Lyman, B.S. 5
Silurian: Willard, B. 42
Sullivan Co.: Claghorn, C.R. 1
  Bernice coal basin: Ashburner, C.A. 32
Susquehanna Co.: Meredith, T. 1

bituminous
Allegheny Co.: Billings, M.H. 1; Griswold, W.T. 1; Lesley, J.P. 56; Rayburn, J.M. 1; Sisler, J.D. 1; Stevenson, J.J. 3, 4
  Beaver quadrangle: Woolsey, L.H. 3, 4
  Brownsville quadrangle: Campbell, M.R. 2
  Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
  Freeport quadrangle: Hughes, H.H. 1
  New Kensington quadrangle: Richardson, G.B. 9
  northern: White, I.C. 6
  Pittsburgh bed: D'Invilliers, E.V. 6
  Pittsburgh quadrangle: Johnson, M.E. 9
  popular: Leighton, H. 3
  reserves: Reese, J.F. 2
  Sewickley quadrangle: Munn, M.J. 5
analyses: Cooper, H.M. 1; Fieldner, A.C. 1, 2; Johnson, W.R. 5; McCreath, A.S. 1, 3, 5; Snyder, H.N. 1
Armstrong Co.: Platt, W.G. 2; Sisler, J.D. 2
  Brookville quadrangle: Graeber, C.K. 3
  Clarion quadrangle: Shaw, E.W. 4
  Elders Ridge quadrangle: Stone, R.W. 3, 5
  Freeport quadrangle: Hughes, H.H. 1
  Kittanning quadrangle: Butts, C. 3, 6
  reserves: Reese, J.F. 3
  Rural Valley quadrangle: Butts, C. 5, 6
  Smicksburg quadrangle: Shaffner, M.N. 3
Beaver Co.: Griswold, W.T. 1; Sisler, J.D. 3; Stevenson, J.J. 3
  analyses: McCreath, A.S. 2
  Beaver quadrangle: Woolsey, L.H. 3, 4
  Burgettstown quadrangle: Shaw, E.W. 3
  distortion: Hice, R.R. 5
  New Castle quadrangle: De Wolf, F.W. 1
  northern: White, I.C. 6
  Sewickley quadrangle: Munn, M.J. 5
  southern: White, I.C. 2
  Zelienople quadrangle: Richardson, G.B. 12
Bedford Co.: Fluck, F. 1; Stevenson, J.J. 8
  Broadtop coal basin: Gardner, J.H. 1
  Devonian: Taylor, R.C. 7
  Ebensburg quadrangle: Butts, C. 4
  Windber quadrangle: Richardson, G.B. 11
Blair Co.: Platt, F. 15; White, I.C. 17
  Ebensburg quadrangle: Butts, C. 4
  Mississippian: Ashburner, C.A. 34
  Patton quadrangle: Campbell, M.R. 8
Bradford Co.: Johnson, W.R. 4; Platt, F. 5; Sisler, J.D. 14; Wells, H. 1
Butler Co.: Chance, H.M. 3; Rayburn, J.M. 1; Sisler, J.D. 4
  analyses: McCreath, A.S. 2
  Butler-Zelienople quadrangles: Richardson, G.B. 12
  Foxburg quadrangle: Shaw, E.W. 2, 4
  Kittanning quadrangle: Butts, C. 3, 6
  New Kensington quadrangle: Richardson, G.B. 9
  northern: Chance, H.M. 4
  Sewickley quadrangle: Munn, M.J. 5
  southern: White, I.C. 6
Cambria Co.: Burrows, J.S. 1; Butts, C. 2; Clemson, T.G. 2; Fulton, J. 2; Phalen, W.C. 2; Platt, F. 4; Sisler, J.D. 5; Stone, R.W. 2
  Barnesboro-Patton quadrangles: Campbell, M.R. 8
  Ebensburg quadrangle: Butts, C. 4
  Elders Ridge quadrangle: Stone, R.W. 2
  Johnstown quadrangle: Phalen, W.C. 3, 4
  reserves: Reese, J.F. 4
  Windber quadrangle: Richardson, G.B. 11
Cameron Co.: Sheafer, A.W. 1; Sisler, J.D. 6
Centre Co.: D'Invilliers, E.V. 4; Platt, F. 14; Sisler, J.D. 6
Clarion Co.: Chance, H.M. 6
  Brookville quadrangle: Graeber, C.K. 3
  Clarion quadrangle: Lines, E.F. 2; Shaw, E.W. 4

  - Foxburg quadrangle: Shaw, E.W. 4
  - Kittanning quadrangle: Butts, C. 3, 6
  - natural briquettes: Schopf, J.M. 2
  - reserves: Sisler, J.D. 22
  - Rural Valley quadrangle: Butts, C. 5, 6
- Clearfield Co.: Ashley, G.H. 3, 48; Chance, H.M. 14; Johnson, W.R. 2; Kemp, J.F. 4; Platt, F. 1
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Curwensville quadrangle: Ashley, G.H. 68
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - reserves: Reese, J.F. 5
- Clinton Co.: Leeds, S.P. 1; Platt, F. 13, 14; Sisler, J.D. 6
  - Karthaus coal basin: Harvey, I.A. 1
  - Renovo coal basin: Ashburner, C.A. 13
  - Westport area: Chance, H.M. 16
- Crawford Co.: Sisler, J.D. 14
- Elk Co.: Ashburner, C.A. 28; Jackson, C.T. 1, 2; Sisler, J.D. 8
- Fayette Co.: Hickok, W.O. 10; Platt, F. 3; Sisler, J.D. 9; Stevenson, J.J. 5
  - Accident-Grantsville quadrangles: Martin, G.C. 3
  - Brownsville-Connellsville quadrangles: Campbell, M.R. 2
  - Masontown-Uniontown quadrangles: Campbell, M.R. 1
  - Pittsburgh seam: Fieldner, A.C. 3
  - reserves: Reese, J.F. 6
  - Waynesburg quadrangle: Stone, R.W. 4
  - western: Stevenson, J.J. 4
- Forest Co.: Ashburner, C.A. 29; Sisler, J.D. 14
- Fulton Co.: Stevenson, J.J. 8
  - Broadtop coal basin: Gardner, J.H. 1
  - generalized: Ashley, G.H. 38; Campbell, M.R. 13
- Greene Co.: Boileau, J.W. 1; Sisler, J.D. 11; Stevenson, J.J. 3; Stone, R.W. 33
  - Amity quadrangle: Clapp, F.G. 4, 6
  - Claysville quadrangle: Munn, M.J. 7
  - Masontown quadrangle: Campbell, M.R. 1
  - reserves: Reese, J.F. 7
  - Rogersville quadrangle: Clapp, F.G. 5
  - Waynesburg quadrangle: Stone, R.W. 4
- Huntingdon Co.: Ashburner, C.A. 1; Fluck, F. 1; White, I.C. 14
  - Broadtop coal basin: Gardner, J.H. 1
  - Huntingdon quadrangle: Butts, C. 20
- Indiana Co.: Anderson, W. 1; Hall, R.D.N. 1; Peck, F.B. 6; Phalen, W.C. 2; Platt, W.G. 1; Sisler, J.D. 10
  - Barnesboro quadrangle: Campbell, M.R. 8
  - Elders Ridge coal field: Stone, R.W. 2
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Indiana quadrangle: Richardson, G.B. 2
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - Latrobe quadrangle: Campbell, M.R. 6
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - reserves: Reese, J.F. 8
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Jefferson Co.: Peck, F.B. 6; Platt, F. 1, 3; Sisler, J.D. 12
  - Brookville coal, correlation: Foose, R.M. 5
  - Brookville quadrangle: Graeber, C.K. 3
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - reserves: Sisler, J.D. 23
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Lawrence Co.: Chance, H.M. 3; Sisler, J.D. 13; White, I.C. 5
  - New Castle quadrangle: De Wolf, F.W. 1
  - Zelienople quadrangle: Richardson, G.B. 12
- Lycoming Co.: Hodge, J.T. 2; Sherwood, A. 2; Sisler, J.D. 6
- McKean Co.: Ashburner, C.A. 14; Lesley, J.P. 51; Needham, B. 1; Sisler, J.D. 14
- Mercer Co.: Chance, H.M. 3; Griswold, E. 1; Sisler, J.D. 14; White, I.C. 7
- Northern: Taylor, R.C. 5
- origin: Ashley, G.H. 20
- Perry Co., Devonian: Taylor, R.C. 7
- petrography: Theissen, R. 1; Turner, H.G. 1
- Potter Co.: Platt, F. 5; Sisler, J.D. 14
  - Coudersport coal basin: Platt, F. 8
  - Oleona coal basin: Platt, F. 11
  - Pine Creek coal basin: Platt, F. 12
- reserves: Ashley, G.H. 18; Chance, H.M. 12; Reese, J.F. 1, 12
- Somerset Co.: Althouse, H.W. 1, 3; Fulton, J. 1; Johnson, W.R. 9; Jones, H.G. 1; Lesley, J.P. 19; Phalen, W.C. 2; Platt, F. 4; Prosser, A.G. 1; Sisler, J.D. 17

    - Accident quadrangle: Martin, G.C. 3
    - analyses: Campbell, M.R. 10; U.S.G.S. 7
    - Johnstown quadrangle: Phalen, W.C. 3, 4
    - low-volatile content: Lesley, J.P. 14
    - northern: Sisler, J.D. 18
    - Quemahoning coal field: Kimball, J.P. 2
    - reserves: Reese, J.F. 9
    - Somerset-Windber quadrangles: Richardson, G.B. 11
    - Southampton Twp.: Johnson, W.R. 12
    - southern: Sisler, J.D. 19
  - Southeastern: Burroughs, W.G. 2
  - Southwestern: Abernathy, G.E. 1; D'Invilliers, E.V. 9; Hildreth, S.P. 1; Pechin, E.C. 1; Pomeroy, S.W. 1; Theissen, R. 2; Stevenson, J.J. 2; Stone, R.W. 10; Wall, J.S. 1; White, I.C. 23, 29
    - partings: Gresley, W.S. 4
    - petrography: Theissen, R. 2
    - Pittsburgh seam: Fieldner, A.C. 4
  - Sullivan Co.: Platt, F. 9; U.S.G.S. 1
  - Tioga Co.: Hardt, A. 1; Meade, W. 3; Platt, F. 5; Sisler, J.D. 14; Taylor, R.C. 6
    - analyses: Clemson, T.G. 3
  - Venango Co.: Sisler, J.D. 14
    - Foxburg quadrangle: Shaw, E.W. 4
  - Warren Co.: Sisler, J.D. 14
    - Warren quadrangle: Butts, C. 11
  - Washington Co.: Boileau, J.W. 1; Griswold, W.T. 1; Sisler, J.D. 15; Stevenson, J.J. 3; Theissen, R. 4
    - Amity quadrangle: Clapp, F.G. 4, 6
    - analyses: U.S.G.S. 1
    - Brownsville quadrangle: Campbell, M.R. 2
    - Burgettstown - Carnegie quadrangles: Shaw, E.W. 3
    - Claysville quadrangle: Munn, M.J. 7
    - Masontown quadrangle: Campbell, M.R. 1
    - Pittsburgh bed: D'Invilliers, E.V. 6
    - Pittsburgh quadrangle: Johnson, M.E. 9
    - reserves: Reese, J.F. 10, 11
    - Rogersville quadrangle: Clapp, F.G. 5
    - Waynesburg quadrangle, Stone, R.W. 4
  - Western: Adams, T.K. 1, 2; Ashley, G.H. 40, 67; Bryan, P.W. 1; Caddell, H.M. 1; Campbell, M.R. 5; Cooper, H.M. 2; Heurteau, C.E. 1; Hosler, R.N. 1; Marshall, C.E. 1, 2; Owen, D.D. 1; Ramsey, G.S. 1; Rogers, H.D. 8; Seddon, W. 1; Sisler, J.D. 21, 24, 27; Stadnichenko, T.M. 1; Stevenson, J.J. 1; Theissen, R. 1, 3; White, C.D. 5; White, I.C. 18, 21; Whittlesey, C. 3
    - analyses: Campbell, M.R. 9
    - oil-bearing: Ashley, G.H. 26
    - petrography: Theissen, R. 3
    - pyrite-bearing: Brown, A.P. 1
    - sulphur content: Selvig, W.A. 1
  - Westmoreland Co.: Phalen, W.C. 2; Platt, F. 3; Rayburn, J.M. 1; Sisler, J.D. 16; Stevenson, J.J. 5
    - Connellsville quadrangle: Campbell, M.R. 2
    - fractures: Wasmuth, H.A. 2
    - Freeport quadrangle: Hughes, H.H. 1
    - Greensburg quadrangle: Johnson, M.E. 8
    - Johnstown quadrangle: Phalen, W.C. 3, 4
    - Latrobe quadrangle: Campbell, M.R. 6
    - New Kensington quadrangle: Richardson, G.B. 9
    - Pittsburgh bed: D'Invilliers, E.V. 6
    - Pittsburgh quadrangle: Johnson, M.E. 9
    - Somerset quadrangle: Richardson, G.B. 11
    - western: Stevenson, J.J. 4

- *cannel*
  - Armstrong Co.: Ashley, G.H. 1
  - Beaver Co.: Ashley, G.H. 1; Mansfield, I.F. 3
    - pebble-bearing: Lesley, J.P. 45
  - Clearfield Co.: Ashley, G.H. 1
  - McKean Co.: Needham, B. 1
  - Western: Ashley, G.H. 11, 12; Fettke, C.R. 4

- *splint*
  - Pennsylvania: Sprunk, G.C. 1

COBALT
  - Lebanon Co., Cornwall area: Lesley, J.P. 53

COELENTERATA
  - Carbon Co., Devonian: Willard, B. 43
  - hydrozoan, Lancaster Co., Cambrian: Ruedemann, R. 1
  - Lancaster Co., Cambrian: Resser, C.E. 3
  - Pennsylvania, Devonian: Willard, B. 39
  - Pike Co., Devonian, Hamilton group: Heilprin, A. 2

COLERAINITE
  - Chester Co.: Shannon, E.V. 1

COLUMBIA COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvanian-Northeastern

Areal geology
Columbia Co.: White, I.C. 12
Ground water
Columbia Co.: Lohman, S.W. 1
Historical geology
Silurian, oolitic iron ore: Van Ingen, G. 2
Silurian-Mississippian: White, I.C. 12
Maps
Geologic: Lesley, J.P. 46, 47; White, I.C. 12
Paleontology
fish, Devonian: Leidy, J. 2
nautiloid, Silurian: Mook, R.R. 1
Physical geology
anthracite basins, structure: Lyman, B.S. 8
Physiography
glacial geology: White, I.C. 12

COLUMBITE, *see also* Radioactive minerals
Delaware Co.: Genth, F.A. 25; Lewis, H.C. 28; Smith, I.F. 1; Wherry, E.T. 2
Philadelphia Co.: Wherry, E.T. 2

CONCRETIONS
Bedford Co., caves: Stone, R.W. 32
Centre Co.: Cathcart, S.H. 1
calcareous: Roddy, H.J. 4
Lancaster Co., algal: Price, J.W. 1; Roddy, H.J. 2, 4
Huntingdon Co., caves: Stone, R.W. 32
Mifflin Co., caves: Stone, R.W. 32
Perry Co., calcareous: Roddy, H.J. 4

CONNATE WATER
Butler Co.: Richardson, G.B. 3
Southwestern, absence: Reeves, F. 1
Washington Co.: Richardson, G.B. 3
Western: Torrey, P.D. 4
barium-bearing: Heck, E.T. 1

CONSTRUCTION MATERIAL, *see also* individual types
Pennsylvania, road-building resources: Mattimore, H.S. 1

COPIAPITE
Schuylkill Co.: Reinhold, E.S. 1

COPPER, *see also* copper-bearing minerals
Adams Co.: Bailey, J.T. 1; Bevier, G.M. 1; Blandy, J.F. 2; Frazer, P. 17, 19, 21, 26, 33; Henderson, C.H. 1; Ross, C.S. 2; Stose, G.W. 11, 21; Wherry, E.T. 7
Fairfield-Gettysburg quadrangles: Stose, G.W. 27
Bedford Co.: Ross, C.S. 2
Bradford Co.: Partz, A. 1; Wells, H. 1
Bucks Co.: Lyman, B.S. 9
Allentown quadrangle: Miller, B.L. 14
Trenton quadrangle: Bascom, F. 10
Chester Co.: Lesley, J.P. 41; Mason, J.W. 1; Mitchill, T.D. 1; Smith, J.L. 1
Norristown quadrangle: Bascom, F. 9
Phoenixville quadrangle: Bascom, F. 21
Cumberland Co., Fairfield quadrangle: Stose, G.W. 27
Franklin Co.: Bevier, G.M. 1; Blandy, J.F. 2; Henderson, C.H. 1; Stose, G.W. 11; Werry, E.T. 7
Fairfield quadrangle: Stose, G.W. 27
Lancaster Co.: Frazer, P. 29
Lebanon Co.
Cornwall mine: D'Invilliers, E.V. 7; Lesley, J.P. 53
popular: Stone, R.W. 51
Lehigh Co., Allentown quadrangle: Miller, B.L. 14
Montgomery Co.: Anon. 4; Carter, O.C.S. 1; Lyman, B.S. 9
Norristown quadrangle: Bascom, F. 9
Northampton Co., Allentown quadrangle: Miller, B.L. 14
Pennsylvania: Ashley, G.H. 76; Weed, W.H. 1
general: Corbin, J.R. 5
Philadelphia Co., Trenton quadrangle: Bascom, F. 10
Southeastern: Anon. 2; Frazer, P. 31; Wherry, E.T. 4
Wyoming Co.: Butler, R.D. 2; White, I.C. 12
York Co.: Frazer, P. 19, 37; Jandorf, M.L. 1; Stose, G.W. 39

COPROLITES
Chester Co., Triassic, reptile: Lea, I. 11

CORALS, *see* Coelenterata

CORDIERITE
(fahlunite), Philadelphia Co.: Lewis, H.C. 27
Lancaster Co.: Tomlinson, W.H. 4

CORUNDELLITE, *see* Margarite

CORUNDUM
Chester Co.: Genth, F.A. 9; Jefferies, W.W. 1; Lea, I. 15; Leidy, J. 6; Lewis, J.V. 1; McKinstry, H.E. 3; Pennypacker, C.H. 2; Pratt, J.H. 1; Stone, R.W. 47; Willcox, J. 1
hydrothermal origin: Larsen, E.S. 1

Delaware Co.: Genth, F.A. 9; Meier, A.E. 2; Pennypacker, C.H. 2; Pratt, J.H. 1; Stone, R.W. 47; Tomlinson, W.H. 2; Willcox, J. 2
Lehigh Co.: Pennypacker, C.H. 2; Smith, E.F. 1, 2; Stone, R.W. 47
Philadelphia Co.: Seybert, A. 1; Silliman, B. 1
Southeastern: Stone, R.W. 39

CRAWFORD COUNTY, *see also* Pennsylvania, Pennsylvania-Northern, Pennsylvania-Northwestern, and Pennsylvania-Western

Areal geology
Crawford Co.: White, I.C. 9

Economic geology
coal, bituminous: Sisler, J.D. 14, 27
natural gas: White, I.C. 9
Meadville area: Johnson, M.E. 2
Titusville quadrangle: Dickey, P.A. 6
petroleum: Dickey, P.A. 2
Titusville quadrangle: Dickey, P.A. 6
stone: White, I.C. 9

Ground water
Crawford Co.: Leggette, R.M. 1

Historical geology
Devonian, Titusville quadrangle: Dickey, P.A. 2
Devonian-Mississippian: Prosser, C.S. 4
Titusville quadrangle: Dickey, P.A. 6
Devonian-Pleistocene: White, I.C. 9
Mississippian: DeWitt, W. 1

Maps
Economic
petroleum and gas, Titusville quadrangle: Dickey, P.A. 6; Sherrill, R.E. 7
Geologic: Lesley, J.P. 46, 47; White, I.C. 9
Structure contour
Berea sandstone, Mississippian: DeWitt, W. 1
Titusville quadrangle, Devonian sands: Dickey, P.A. 2

Paleontology
Devonian-Mississippian fauna: Millward, W. 1; Prosser, C.S. 4
fish, Mississippian: Eastman, C.R. 1
gastropods, Pleistocene marl: Brooks, S.F. 1

Physical geology
folding, landslides: Smallwood, W.M. 1

Physiography
glacial geology: White, I.C. 9
Lake Pymatuning, Pleistocene: Anon. 48
Shenango quadrangle: Kohler, F.W. 1

CREEP
Southwestern: Sharp, C.F.S. 1

CRETACEOUS, *see also* Mesozoic
Bucks Co., clays: Lewis, H.C. 8
Pennsylvania: Barrell, J. 5; Braun, E.L. 1; Schuchert, C. 3; Willis, B. 8
Southeastern: McGee, WJ 2; Miller, B.L. 23; White, C.A. 1
Western: Gibson, J.B. 2

CRINOIDEA
Allegheny Co., Pennsylvanian, Ames limestone: Burke, J.J. 1
Carbon Co., Devonian: Goldring, W. 2
Huntingdon Co., Mississippian, Pocono Formation: Girty, G.H. 3
Juniata Co., Silurian: Witmer, J.D. 1
Warren Co., Devonian: Goldring, W. 1

CROCIDOLITE, *see* Riebeckite

CRUSTACEA, *see also* Arthropoda, Eurypterida, Ostracoda, and Trilobita
Beaver Co., Pennsylvanian: Mansfield, I.F. 3
branchiopods
Montgomery Co., Triassic: Bock, W. 2
Perry Co., Devonian: Cleaves, A.B. 1
York Co., Triassic: Wanner, H.E. 2
Franklin Co., Ordovician: Ruedemann, R. 1
Lehigh Co., Ordovician: Ruedemann, R. 4
McKean Co., Devonian: Eller, E.R. 2
Pennsylvania, Paleozoic: Vodges, A.W. 2, 3
pteropod, Erie Co., Devonian: Williams, H.S. 3
Susquehanna Co., Devonian: Caster, K.E. 9
Warren Co., Devonian: Eller, E.R. 1
xiphosuran
Luzerne Co., Pennsylvanian: Packard, A.S. 1; Willard, B. 21
Warren Co., Devonian: Beecher, C.E. 5
York Co., Triassic: Wanner, H.E. 1

CUMBERLAND COUNTY, *see also* Pennsylvania, Pennsylvania-Central, and Pennsylvania-Southcentral

Areal geology
Fairfield quadrangle: Stose, G.W. 27

Economic geology
abrasives, Fairfield quadrangle: Stose, G.W. 27
clay: Ries, H. 5; Stose, G.W. 8
Mt. Holly Springs area: Foose, R.M. 11
copper, Fairfield quadrangle: Stose, G.W. 27

- iron: D'Invilliers, E.V. 8; Frazer, P. 20; Harden, J.W. 1; Lesley, J.P. 16
  - Boiling Springs area: Burton, S.E. 1
  - Fairfield quadrangle: Stose, G.W. 27
  - White Rocks area: Foose, R.M. 14
- kaolin: Leighton, H. 7
- limestone: D'Invilliers, E.V. 8
- manganese
  - Boiling Springs area: Burton, S.E. 1
  - Fairfield quadrangle: Stose, G.W. 27
  - Reading Banks: Foose, R.M. 8
  - White Rocks area: Foose, R.M. 14
- marl: Dickey, F.B.R. 1
- phosphate: Stone, R.W. 47; Stose, G.W. 7
- quartz, Fairfield quadrangle: Stose, G.W. 27
- roofing granules, Fairfield quadrangle: Stose, G.W. 27
- serpentine, Fairfield quadrangle: Stose, G.W. 27
- sand and gravel, Fairfield quadrangle: Stose, G.W. 27
- stone, Fairfield quadrangle: Stose, G.W. 27

Ground water
- Boiling Springs, popular: Stone, R.W. 45

Historical geology
- Eocene: Conrad, T.A. 5
- Precambrian-Cambrian, Fairfield quadrangle: Stose, G.W. 27
- Precambrian-Triassic: Hickok, W.O. 8

Maps
- Economic
  - Fairfield quadrangle, mineral resources: Stose, G.W. 27
  - iron: D'Invilliers, E.V. 8; Foose, R.M. 8; Frazer, P. 20; Lesley, J.P. 16; McCreath, A.S. 5
  - limestone: D'Invilliers, E.V. 8
- Geologic: Lesley, J. P. 37, 46, 47
  - Fairfield quadrangle: Stose, G.W. 27
  - White Rocks area: Foose, R.M. 14
- Structure, Fairfield quadrangle: Stose, G.W. 27

Mineralogy
- barrandite: Gordon, S.G. 9
- beraunite: Gordon, S.G. 9
- cacoxenite: Gordon, S.G. 9
- globosite: Gordon, S.G. 9
- strengite: Gordon, S.G. 9
- variscite: Gordon, S.G. 9
- wavellite: Gordon, S.G. 8, 9

Paleontology
- brachiopods, Cambrian: Walcott, C.D. 9
- cephalopods, Ordovician: Foerste, A.F. 2
- reptiles, Triassic: Willard, B. 19
- starfish, Ordovician: Willard, B. 38
- trilobites, Ordovician: Raymond, P.E. 8

Petrology
- aporhyolite, Blue Ridge area: Bascom, F. 2
- diabase: Gibson, J.B. 1
- limestone, magnesian: Lesley, J.P. 30

Physical geology
- stalactites, iron oxide: Foose, R.M. 9
- structure, Blue Ridge folding: Cloos, E. 6

Physiography
- drainage patterns, Conodoguinet Creek: Strahler, A.N. 2
- terraces, Susquehanna River: Mackin, J.H. 1

CUPRITE
- (chalcotrichite), Montgomery Co.: Blake, W.P. 2
- Philadelphia Co.: Lewis, H.C. 39

DAMOURITE, *see* Muscovite

DANNEMORITE, *see* Amphibole

DATOLITE
- Montgomery Co.: Wherry, E.T. 6

DAUPHIN COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, Pennsylvania-Northeastern, and Pennsylvania-Southeastern

Areal geology
- Kittatinny Mtn.: Foose, R.M. 2
- Middletown quadrangle: Stose, G.W. 33

Economic geology
- clay, Middletown quadrangle: Stose, G.W. 33
- coal, anthracite: Johnson, W.R. 8; Lea, I. 5; Wasmuth, H.A. 4
  - analyses: Johnson, W.R. 7
  - crystalloid: Johnson, W.R. 6
  - westward bituminization: Lea, M.C. 1
- iron: D'Invilliers, E.V. 8
  - Hummelstown area: Spencer, A.C. 2
- limestone: D'Invilliers, E.V. 8
- slate: Behre, C.H. 9
- stone
  - Middletown quadrangle: Stose, G.W. 33
  - popular: Bolton, F.J. 1

Ground water
- Dauphin Co.: Lohman, S.W. 1

Historical geology
- Devonian: Van Ingen, G. 1

Ordovician, Martinsburg Formation: Gorman, J.P. 1; Laird, W.M. 1; Secrist, M.H. 1
Ordovician-Mississippian: Willard, B. 67
Ordovician-Tertiary, Middletown quadrangle: Stose, G.W. 33
Pennsylvanian, Southern anthracite field: Ashburner, C.A. 18
Silurian-Pennsylvanian: Willard, B. 46
Tertiary gravel: Stose, G.W. 26

Maps
Economic
iron: D'Invilliers, E.V. 8
limestone: D'Invilliers, E.V. 8; Swain, F.M. 2
Geologic: Lesley, J.P. 46, 47, 63
Middletown quadrangle: Stose, G.W. 33
Southern anthracite field: Ashburner, C.A. 18

Paleontology
amphibian, Pennsylvanian: Leidy, J. 8
brachiopods, Ordovician: Secrist, M.H. 1
coral reef, Devonian, Hamilton group: Willard, B. 30
fish, Pennsylvanian: Leidy, J. 8
Ordovician, Martinsburg Formation: Secrist, M.H. 1
plants, Pennsylvanian: Leidy, J. 8; Taylor, R.C. 9; White, C.D. 3
trilobites, Ordovician: Secrist, M.H. 1

Petrology
diabase: Gibson, J.B. 1

Physical geology
earthquakes: Neumann, F. 1
faults: Van Ingen, G. 1
anthracite region: Wasmuth, H.A. 4
section thickening: Cloos, E. 4
structure
Cove Mtn.: Seltzer, G. 1
Kittatinny-Little Mtns.: Foose, R.M. 1
Southern anthracite field: Ashburner, C.A. 18

Physiography
glacial deposits, Susquehanna River: Bashore, H.B. 1
terraces
origin: Moss, J.H. 1
Susquehanna River: Mackin, J.H. 1; Meyerhoff, H.A. 7; Stose, G.W. 26

DELAWARE COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Southeastern

Areal geology
Chester-Norristown quadrangles: Bascom, F. 9
Darby Creek valley: Weagle, L.T. 1
Delaware Co.: Hall, C.E. 9
popular: Lightfoot, T.M. 1
Dove Lake area: Ravitch, R. 1
Haverford-Marple Twps.: Rand, T.D. 16
Newton-Radnor Twps.: Rand, T.D. 16
Piedmont district: Bascom, F. 8
West Chester quadrangle: Bascom, F. 18

Economic geology
asbestos: Willcox, J. 2
beryl: Stone, R.W. 47
chromium: Corbin, J.R. 4; Phalen, W.C. 5; Rand, T.D. 9; Willcox, J. 2
clay: Ries, H. 5
corundum: Pratt, J.H. 1; Willcox, J. 2
feldspar: Ashley, G.H. 24; Bastin, E.S. 1; Hopkins, T.C. 6; Stone, R.W. 29, 47; Watts, A.S. 1; Willcox, J. 2
Chester-Norristown quadrangles: Bascom, F. 9
West Chester quadrangle: Bascom, F. 18
iron: Willcox, J. 2
kaolin: Hopkins, T.C. 6
Brandywine Summit area: Ashburner, C.A. 33
origin: Lesley, J.P. 54
West Chester quadrangle: Bascom, F. 18
mica: Sterrett, D.B. 1
soapstone: Willcox, J. 2
stone: Hall, C.E. 9
Chester-Norristown quadrangles: Bascom, F. 9

Ground water
well logs: Carter, O.C.S. 2
West Chester quadrangle: Bascom, F. 18

Historical geology
Cambrian: Rand, T.D. 20
Ordovician, serpentine: Rand, T.D. 12
Precambrian-Tertiary
Chester-Norristown quadrangles: Bascom, F. 9
Precambrian-Triassic: Hall, C.E. 9
Radnor area: Rand, T.D. 16
West Chester quadrangle: Bascom, F. 18

Maps
Economic, feldspar: Bastin, E.S. 1; Stone, R.W. 29
Geologic: Hall, C.E. 9; Lesley, J.P. 46, 47
Chester-Norristown quadrangles: Bascom, F. 9
Haverford-Marple area: Rand, T.D. 16
Newton-Radnor area: Rand, T.D. 16

West Chester quadrangle: Bascom, F. 18
Isograd, Glenarm Series: McKinstry, H.E. 4
Structure, West Chester quadrangle: Bascom, F. 18
Mineralogy
actinolite: Seybert, A. 5; Thomson, T. 2
albite: Genth, F.A. 28; Lea, I. 14
allanite: Wherry, E.T. 2
andalusite: Dana, E.S. 1
anhydrite: Koenig, G.A. 6, 7
antholite: Leeds, A.R. 7
argentine: Gordon, S.G. 1
asbestos: Rand, T.D. 11
autunite: Wherry, E.T. 2
axinite: Wherry, E.T. 15
bindheimite: Wherry, E.T. 2
bucholzite: Thomson, T. 2
chabazite: Palmer, L. 1
clay: Tomlinson, W. Harold 1
columbite: Genth, F.A. 25; Lewis, H.C. 28; Smith, I.F. 1; Wherry, E.T. 2
corundum: Genth, F.A. 9; Meier, A.E. 2; Pennypacker, C.H. 2; Tomlinson, W.H. 2
delawarite: Lea, I. 14
euxinite; Law, E.S. 3; Wherry, E.T. 2
feldspar; Lea, I. 14
gahnite: Genth, F.A. 25
garnet: Cardeza, J.M. 2; Eyerman, J. 6; Keller, H.A. 1; Law, E.S. 1; Robinson, W.C. 1; Strock, L.W. 2
grossularite: Koenig, G.A. 3
gummite: Wherry, E.T. 2
gypsum: Rand, T.D. 6
harmotome: Meier, A.E. 1, 2, 3
heulandite: Koenig, G.A. 3
hornblende: Sharples, S.P. 1
hyalophane: Meier, A.E. 2
ilmenite: Wherry, E.T. 2
kyanite: Stone, R.W. 47; Thomson, T. 1
leidyite: Koenig, G.A. 1, 3
lennilite: Lea, I. 14
melanosiderite: Cooke, J.P. 3
mica, crystal inclusions: Rand, T.D. 13
mineral collecting: Benge, E. 2; Hall, C.E. 9; Lea, I. 1
minerals, analyses: Genth, F.A. 20
molybdenite: Seybert, A. 3
monazite: Hamilton, S.H. 1; Wherry, E.T. 2, 25
moonstone: Leeds, A.R. 9
muscovite: Lewis, H.C. 31
orthoclase: Leeds, A.R. 2
pimelite: Goldsmith, E. 1
pyrite: Penfield, S.L. 2
radioactive minerals: Wherry, E.T. 2
rutile: Bruce, A. 1
spinel: Nicol, W. 1
torbernite: Wherry, E.T. 2
uraninite: Wherry, E.T. 2
uranophane: Wherry, E.T. 2
vermiculite: Cooke, J.P. 4
xenotime: Wherry, E.T. 2
zeolites: Koenig, G.A. 5
zoisite: Koenig, G.A. 3
Paleontology
elephant, Pleistocene: Leidy, J. 9
Petrology
amphibolite: Goldsmith, E. 1
diabase: Bascom, F. 3
gabbro, alteration: Watson, E.H. 3
gabbro-phonolite: Goldsmith, E. 1
Glenarm series, mineral isograds: McKinstry, H.E. 4
granite: Watson, E.H. 4
granite-serpentine relations: Meier, A.E. 4
granodiorite
  hydrothermal origin: Postel, A.W. 4
  structure: Postel, A.W. 3
harmotome dike: Meier, A.E. 2
pegmatite, corundum-bearing: Meier, A.E. 5
perido-steatite: Bascom, F. 3
plumasite: Gordon, S.G. 3
rocks, analyses: Genth, F.A. 20
serpentine: Rand, T.D. 5, 12, 15
  Radnor area: Rand, T.D. 16
steatite: Rand, T.D. 5
symplectite, Springfield area: Berman, J. 1
Physiography
boulder fields: Martin, D.S. 2
terraces, high-level: Lesley, J.P. 33

DELAWARITE, *see* Orthoclase

DELTAS
Monroe Co., Delaware River: Happ, S.C. 2
Pennsylvania
  Devonian, Catskill: Barrell, J. 6
  Ordovician: Grabau, A.W. 11
  recognition. Grabau, A.W. 10
  Silurian: Grabau, A.W. 11
Pike Co., Delaware River: Happ, S.C. 2

DENDRITES
Montgomery Co.: Lewis, H.C. 10

DESCLOISITE
Chester Co.: Smith, J.L. 1

DEVONIAN, *see also* Paleozoic
Allegheny Co.: Ingham, A.I. 2; White, I.C. 20
  Beaver quadrangle: Woolsey, L.H. 4
  Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3

Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
Freeport quadrangle: Hughes, H.H. 1
McDonald oil field: Ingham, A.I. 3
Pittsburgh quadrangle, oil sands: Johnson, M.E. 6
Sewickley quadrangle: Munn, M.J. 4, 5
Armstrong Co.: Lesley, J.P. 11; Lucas, D.J. 1; White, I.C. 25
Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4
Elders Ridge quadrangle: Stone, R.W. 3, 5
Foxburg quadrangle: Shaw, E.W. 2
Freeport quadrangle: Hughes, H.H. 1
Kittanning quadrangle: Butts, C. 3
Beaver Co.
Beaver quadrangle: Woolsey, L.H. 4
Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
Sewickley quadrangle: Munn, M.J. 4, 5
Bedford Co.: Cameron, N.S. 1; Miller, E. 1; Stevenson, J.J. 8
Ebensburg quadrangle: Butts, C. 4
Hollidaysburg - Huntingdon quadrangles: Butts, C. 20
Pawpaw quadrangle: Stose, G.W. 12
Windber quadrangle: Richardson, G.B. 11
Blair Co.: Butts, C. 7; Platt, F. 6, 15; Swartz, F.M. 17
Chemung Formation: Willard, B. 14
Ebensburg quadrangle: Butts, C. 4
Hollidaysburg quadrangle: Butts, C. 20
Tyrone quadrangle: Butts, C. 18
Bradford Co.: Burroughs, W.G. 5; Claypole, E.W. 3; Lilley, A.T. 1; Sherwood, A. 1; Torrey, P.D. 3
Hamilton group: Reeves, J.R. 2
Butler Co.: Chance, H.M. 4; Lucas, D.J. 1
Foxburg quadrangle: Shaw, E.W. 2, 4
Hilliards quadrangle: Sherrill, R.E. 4, 9
Kittanning quadrangle: Butts, C. 3
Sewickley quadrangle: Munn, M.J. 4, 5
Cambria Co.: Miller, E. 1
Chemung Formation: Willard, B. 14
Ebensburg quadrangle: Butts, C. 4
Johnstown quadrangle: Phalen, W.C. 3, 4
Windber quadrangle: Richardson, G.B. 11
Cameron Co.: Ashburner, C.A. 28; Cathcart, S.H. 10
Carbon Co.: Ashburner, C.A. 24; Prosser, C.S. 3; Winslow, A. 2
Lehigh water gap: Chance, H.M. 11
Central: Butts, C. 17; Willard, B. 45, 46
Hamilton group: Claypole, E.W. 25; Willard, B. 24, 25
Harrisburg axis: Willard, B. 57
Helderberg limestone: Reeside, J.B. 1; Swartz, F.M. 1
Oriskany sandstone: Stow, M.H. 3
Tully limestone: Cooper, G.A. 3
Centre Co.: D'Invilliers, E.V. 4; Ewing, A.L. 1; Taylor, R.C. 1
Bellefonte quadrangle: Butts, C. 16
Tyrone quadrangle: Butts, C. 18
Clarion Co.: Lucas, D.J. 1
Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4
Foxburg quadrangle: Shaw, E.W. 2, 4
Kittanning quadrangle: Butts, C. 3
Oil City quadrangle: Dickey, P.A. 4, 5
Clearfield Co., Curwensville quadrangle: Ashley, G.H. 68
Clinton Co.: Chance, H.M. 1, 2, 7; Johnson, M.E. 3; Ulmer, L.J. 1
Chemung Formation: Willard, B. 14
Columbia Co.: White, I.C. 12
Crawford Co.: Prosser, C.S. 4; White, I.C. 9
Titusville quadrangle: Dickey, P.A. 2, 6
Dauphin Co.: Willard, B. 46, 67; Van Ingen, G. 1
Eastern
Chemung shore line: Willard, B. 20
Hamilton group: Willard, B. 17
Onondaga limestone: Kindle, E.M. 3
Elk Co.: Ashburner, C.A. 8, 16, 28; Cathcart, S.H. 9
Erie Co.: Torrey, P.D. 3; White, I.C. 9
Fayette Co.: Hickok, W.O. 10; Moyer, F.T. 2; Stevenson, J.J. 5
Accident-Grantsville quadrangles: Martin, G.C. 3
Chemung Formation: Willard, B. 14
Ligonier Valley: Stevenson, J.J. 5
Masontown-Uniontown quadrangles: Campbell, M.R. 1
Waynesburg quadrangle: Stone, R.W. 4
Forest Co.: Ashburner, C.A. 28
Oil City quadrangle: Dickey, P.A. 4, 5
Tidioute quadrangle: Cathcart, S.H. 13
Titusville quadrangle: Dickey, P.A. 2, 6
Franklin Co., Hancock quadrangle: Stose, G.W. 12
Fulton Co.: Stevenson, J.J. 8

- Hancock-Pawpaw quadrangles: Stose, G.W. 12
- Mercersburg quadrangle: Stose, G.W. 10
- Greene Co.: Clapp, F.G. 3; Stone, R.W. 8
  - Amity quadrangle: Clapp, F.G. 4, 6
  - Carnegie quadrangle: Munn, M.J. 7
  - Rogersville quadrangle: Clapp, F.G. 5
  - Waynesburg quadrangle: Stone, R.W. 4
- Huntingdon Co.: Ashburner, C.A. 3, 4, 6; Miller, E. 1; White, I.C. 14; Willard, B. 61
  - glaciation: Willard, B. 23
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Tyrone quadrangle: Butts, C. 18
- Indiana Co.: Platt, W.G. 1
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Indiana quadrangle: Richardson, G.B. 2
  - Johnstown quadrangle: Phalen, W.C. 3, 4
- Juniata Co.: D'Invilliers, E.V. 10
- Lackawanna Co.: White, I.C. 12
- Luzerne Co.: White, I.C. 12
- Lycoming Co.: Sherwood, A. 2
  - Oriskany sandstone: Woolman, L. 1
- McKean Co.: Ashburner, C.A. 8, 9, 14, 28; Cathcart, S.H. 8; Fettke, C.R. 20, 24, 28; Torrey, P.D. 3
  - Bradford sand: Ashburner, C.A. 12; Fettke, C.R. 10; Waldo, A.W. 1
  - Sliverville sand: Fettke, C.R. 25
- Mifflin Co.: D'Invilliers, E.V. 10
- Monroe Co.: O'Neill, W.F. 1; Prosser, C.S. 2, 3; Wagner, N.S. 1; White, I.C. 11; Willard, B. 40
- Montour Co.: White, I.C. 12
- Northeastern: Ashburner, C.A. 21; Cooper, G.A. 4; Rogers, H.D. 3, 5; Swartz, C.K. 7; Willard, B. 31
  - Hamilton coral reef: Willard, B. 30
  - Oriskany sandstone: Swartz, C.K. 6; Willard, B. 5
  - Tully clastics: Stevenson, R.E. 2
  - Tully limestone: Skinner, W.S. 1; Stevenson, R.E. 2
- Northern: Cathcart, S.H. 10, 11; Chadwick, G.H. 7; Chance, H.M. 5; Fettke, C.R. 8; Hall, J. 5; Robinson, J.F. 5; Taylor, R.C. 5; Torrey, P.D. 3
  - Catskill Formation: Fuller, M.L. 1
  - Genessee-Tully relationships: Grabau, A.W. 14
  - Oriskany sandstone: Cathcart, S.H. 7; Fettke, C.R. 19
- Northumberland Co.: White, I.C. 12; Willard, B. 11, 46
  - Tully limestone: Willard, B. 18
- Northwestern: Carll, J.F. 2, 3, 4; Caster, K.E. 2, 3, 5, 7; Cohn, H.H. 1; Fettke, C.R. 11, 12, 13, 14; Girty, G.H. 1; Glenn, L.C. 1; Lesley, J.P. 29, 51; Ridgway, T.S. 2; Rogers, H.D. 3; Swartz, C.C. 1; Ver Wiebe, W.A. 2
  - correlation with Ohio and New York: Lesley, J.P. 21
- Pennsylvania: Arnold, C.A. 6; Ashley, G.H. 36; Butts, C. 19; Caster, K.E. 4, 8; Chadwick, G.H. 5, 6; Clarke, J.M. 3; Conrad, T.A. 3; Cooper, G.A. 5; Dawson, J.W. 1; Eaton, A. 2; Grabau, A.W. 7, 12; Hall, J. 10; Honess, C.W. 1; Hopkins, T.C. 3; Kay, G.M. 3; Lesley, J.P. 67; Rogers, H.D. 2; Rogers, W.B. 1; Romer, A.S. 1; Schuchert, C. 3, 23; Stevenson, J.J. 14; Swartz, F.M. 13, 22; Ulrich, E.O. 1; Ver Wiebe, W.A. 4, 7; Vicaire, A. 1; W. van der Gracht, W.A.J.M. 1; Weller, S. 4; Willard, B. 27, 53; Williams, H.S. 4, 5, 6, 8; Willis, B. 8
  - catalog: Lesley, J.P. 57
  - Catskill delta: Barrell, J. 6
  - Catskill Formation: Chadwick, G.H. 2; White, C.D. 2; Willard, B. 13
  - considered Mississippian: Prosser, C.S. 1
  - Catskill-Chemung relations: Barrell, J. 4; Stevenson, J.J. 12
  - climate: White, C.D. 11
  - continental deposits: Willard, B. 55
  - Hamilton group: Willard, B. 37
  - Helderberg limestone: Fisher, F.W. 1; Swartz, F.M. 10
  - Onondaga limestone: Eaton, A. 5; Weller, S. 3; Willard, B. 35
  - Onondaga sea: Kindle, E.M. 2
  - Oriskany sandstone: Claypole, E.W. 22; Cleaves, A.B. 3, 5; Finn, F.H. 1; Hamilton, S.H. 3; Leighton, H.E. 1; Myers, T.H. 1
  - overlap: Grabau, A.W. 5
  - Portage group: Willard, B. 29
  - terminology: Willard, B. 36
  - Tully limestone: Willard, B. 39
- Perry Co.: Claypole, E.W. 16; Willard, B. 33, 67
  - Cardiola shale: Claypole, E.W. 11
  - Catskill Formation: Claypole, E.W. 6
  - Chemung Formation: Willard, B. 14
  - Hamilton sandstone: Claypole, E.W. 12
  - Kingsmill sandstone: Claypole, E.W. 5

  Oriskany sandstone: Willard, B. 4
  Schoharie equivalent: Claypole, E.W. 4
Pike Co.: Prosser, C.S. 3; Wagner, N.S. 1; White, I.C. 11
Potter Co.: Ashburner, C.A. 11, 30; Bennett, J. 1; Cathcart, S.H. 5; Platt, F. 10; Reeves, J.R. 1; Torrey, P.D. 3
  East Fork-Wharton area: Ebright, J.R. 1
  Gaines quadrangle: Fuller, M.L. 4
Schuylkill Co.: Mills, J.R. 1; Sheafer, P.W. 1; Willard, B. 47
Snyder Co.: D'Invilliers, E.V. 10
Somerset Co.
  Accident-Grantsville quadrangles: Martin, G.C. 3
  Johnstown quadrangle: Phalen, W.C. 3, 4
  Somerset-Windber quadrangles: Richardson, G.B. 11
Southcentral: Aiken, W.E.A. 1
Southeastern, Harrisburg axis: Willard, B. 57
Southwestern: Butts, C. 8; Caster, K.E. 7; Hice, R.R. 7; James, J.R. 1; Lafferty, R.C. 1; Laird, W.M. 2; Matteson, L.S. 1; Robinson, J.F. 4; Rogers, H.D. 3, 4; Stevenson, J.J. 7
  Chemung Formation: Willard, B. 14
  subsurface: Bayles, R.E. 1
Susquehanna Co.: Torrey, P.D. 3; White, I.C. 10
Tioga Co.: Ashley, G.H. 49; Bennett, J. 1; Cathcart, S.H. 2, 3, 6; Fettke, C.R. 7, 17; Harding, R.W. 1; Robinson, J.F. 6; Sherwood, A. 1; Torrey, P.D. 3; White, I.C. 25; Willard, B. 6
  Bradford third sand: Krynine, P.D. 4
  Elkton-Tioga quadrangles: Fuller, M.L. 3
  Gaines quadrangle: Fuller, M.L. 4
Union Co.: D'Invilliers, E.V. 10
Venango Co.: Ashburner, C.A. 28; Carll, J.F. 1; Dickey, P.A. 3; Hall, J. 4
  Foxburg quadrangle: Shaw, E.W. 2, 4
  Franklin quadrangle: Dickey, P.A. 5
  Hilliards quadrangle: Sherrill, R.E. 4, 9
  Oil City quadrangle: Dickey, P.A. 4, 5
  Titusville quadrangle: Dickey, P.A. 2, 6
Warren Co.: Hall, J. 8; Johnson, M.E. 7; Randall, F.A. 1; Torrey, P.D. 3
  Tidioute quadrangle: Cathcart, S.H. 13
  Titusville quadrangle: Dickey, P.A. 2, 6
  Warren quadrangle: Butts, C. 11
Washington Co.: Anon. 11; Ingham, A.I. 2; White, I.C. 24, 25
  Amity quadrangle: Clapp, F.G. 4, 6
  Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
  Carnegie quadrangle: Munn, M.J. 6, 7; Shaw, E.W. 3
  McDonald oil field: Ingham, A.I. 3
  Rogersville quadrangle: Clapp, F.G. 5
  Steubenville quadrangle: Griswold, W.T. 2
  Waynesburg quadrangle: Stone, R.W. 4
Wayne Co.: Davis, J.P. 1; Prosser, C.S. 3; Torrey, P.D. 3; White, I.C. 10
Western: Ashburner, C.A. 7, 15, 22, 23; Ashley, G.H. 51; Bennett, J. 1; Bownocker, J.A. 1; Carll, J.F. 2, 7, 9; Caster, K.E. 6, 12; Claypole, E.W. 27; Day, D.T. 2; Fettke, C.R. 15, 21, 22, 26; Hoffacker, B.F. 1; Lesley, J.P. 8, 9; Majorelle, J. 1; Martens, J.H. 1, 2; Otsuka, S. 1; Rittenhouse, G. 2; Sisler, J.D. 26, 28; Ver Wiebe, W.A. 1, 5
  folding: Sherrill, R.E. 3
Westmoreland Co.: White, I.C. 25
  Freeport quadrangle: Hughes, H.H. 1
  Johnstown quadrangle: Phalen, W.C. 3, 4
  Ligonier Valley: Stevenson, J.J. 5
  Somerset quadrangle: Richardson, G.B. 11
Wyoming Co.: White, I.C. 12
  popular: Maxwell, V.L. 1

DEWEYLITE
Berks Co.: Brunner, D.B. 1; Genth, F.A. 21

DIABASE
Adams Co.: Frazer, P. 3, 5; Stose, G.W. 15
  exfoliation boulders: Frazer, P. 2
Berks Co.: Jonas, A.I. 3
  Reading Prong, Ordovician: Fraser, D.M. 7
Bucks Co.: Seybert, A. 1; Stone, R.W. 23
  Precambrian: Jonas, A.I. 3
Chester Co.: Rand, T.D. 24
Cumberland Co.: Gibson, J.B. 1
Dauphin Co.: Gibson, J.B. 1
Delaware Co.: Bascom, F. 3
Lancaster Co.: Frazer, P. 25, 27; Smith, T.P. 1; Tomlinson, W.H. 1
  schist assimilation: Tomlinson, W.H. 7

Lehigh Co.: Jonas, A.I. 3
  Precambrian: Jonas, A.I. 3
  Reading Prong, Ordovician: Fraser, D.M. 7
Montgomery Co.: Jonas, A.I. 3; Wherry, E.T. 6
Northampton Co., Reading Prong, Ordovician: Fraser, D.M. 7
Perry Co.: Claypole, E.W. 16
Philadelphia Co.: Rand, T.D. 4
Southeastern: Hotz, P.E. 1; Lewis, H.C. 38; Ryan, J.D. 2; Stephenson, T.E. 1; Tomlinson, W.H. 6; Wherry, E.T. 10
York Co.: Frazer, P. 5, 11; Stose, G.W. 15

DIASPORE
Chester Co.: Dana, E.S. 2; Lea, I. 15

DIATOMS
Philadelphia Co., Quaternary clay: Cunningham, K.M. 1; Woolman, L. 2

DICKITE
Northumberland-Schuylkill Cos.: Honess, A.P. 4

DIKES, *see also* rock types
Chester Co., post-Triassic: Rogers, H.D. 16
Delaware Co., harmotome-bearing: Meier, A.E. 2
Fayette Co.
  clay, in coal: Price, P.H. 2
  peridotite: Kemp, J.F. 7; Smith, L.B. 1; Sosman, R.B. 1
Greene Co., peridotite: Smith, L.B. 1
Indiana Co., peridotite: Graeber, C.K. 1; Honess, A.P. 1, 2
Southeastern, peridotite, relation to orogeny: Hess, H.H. 1

DINOSAURS, *see* Reptilia

DIORITE
Lehigh Co., granitic assimilation: Fraser, D.M. 2

DISTHENE, *see* Kyanite

DOLOMITE
(ankerite)
  Chester Co.: Koenig, G.A. 2
  Luzerne Co.: Northup, M.A. 2
Franklin Co., analyses: McCreath, A.S. 4
Lancaster Co.: Genth, F.A. 5
Lehigh-Northampton Cos., Allentown quadrangle: Salisbury, S.H. 1
Pennsylvania: Ashley, G.H. 76; Rogers, R.E. 1
Southeastern: Chamberlin, D.S. 1; Weitz, J.H. 1

DOPPLERITE
Lackawanna Co.: Cooper, T. 1; Lewis, H.C. 26

DRAINAGE CHANGES, *see also* Glacial geology
Armstrong Co., Allegheny River: Lesley, J.P. 31
Beaver Co., Big Beaver-Ohio Rivers: White, I.C. 6
Blair Co., fault control: Lesley, J.P. 12
Bucks Co., stream capture: Davis, W.M. 3; Ward, R.D. 1
Butler Co., northern: Chance, H.M. 4
Central, Susquehanna River: Anon. 52
Clarion Co.
  Allegheny River: Chance, H.M. 6; Williams, E.H. 11
  Clarion River: Chance, H.M. 6
Forest-Warren Cos., Allegheny River: Wright, G.F. 14
Greene Co., Ohio River: Stevenson, J.J. 3
Lackawanna-Luzerne Cos.: Itter, H.A. 1
Lake Erie, northern outlet, pre-glacial: Spencer, J.W. 1
Lancaster Co., Susquehanna River deeps: Daly, R.A. 1; Mathews, E.B. 2
Lawrence Co., Big Beaver River: White, I.C. 5
Lehigh Co., Lehigh River: Lesley, J.P. 42; Myers, R.E. 7
Luzerne Co., Susquehanna River: Darton, N.H. 8; Lyman, B.S. 11
Monroe Co., Delaware Valley: Happ, S.C. 1
Northampton Co.
  Lehigh River: Lesley, J.P. 42
  Monocacy River: Borhek, H.T. 1
Northern
  Pleistocene: Williams, E.H. 12
  Susquehanna River, Tertiary: Burroughs, W.G. 4
Northwestern: Leggette, R.M. 1
  Pleistocene: Carll, J.F. 3; Leverett, F. 1
Pennsylvania: Hice, R.R. 6
  faunal evidence: Ortmann, A.E. 1
Pike Co., Pocono Plateau: White, I.C. 11
Southeastern, Delaware River: Miller, R.L. 3
Southwestern: Stone, R.W. 12
Washington Co., Ohio River: Stevenson, J.J. 3
Western: Hice, R.R. 4; Leverett, F. 4
  Beaver River: Hice, R.R. 2

major rivers: Shaw, E.W. 5
Monongahela River: White, I.C. 19
Ohio basin: Chamberlin, T.C. 5
Ohio River: Leverett, F. 7
Spencer River, Pleistocene: Foshay, P.M. 2
Wyoming Co., Susquehanna River: Griffith, W. 1; White, I.C. 12

DRAINAGE PATTERNS
Bedford-Huntingdon Cos., Raystown branch: Stone, R.W. 40
Blair Co., fault control: Lesley, J.P. 12
Cumberland Co., Conodoguinet Creek: Strahler, A.N. 2
Eastern: Bliss, E.F. 3
Franklin Co., shale and limestone adjustment: Sharp, H.S. 1
Greene Co., asymmetrical: Stone, R.W. 25
Pennsylvania: Davis, W.M. 4; Johnson, D.W. 4; Thompson, H.D. 2; Woodward, H.P. 2
Appalachian drainage: Mackin, J.H. 4; Meyerhoff, H.A. 4; Thompson, H.D. 1
origin: Mackin, J.H. 2; Strahler, A.N. 1
structural control: Meyerhoff, H.A. 3, 6
superposition: Johnson, D.W. 3
Snyder-Union Cos., Cretaceous: Davis, W.M. 6
Southeastern: Bascom, F. 6
Triassic influence: Meyerhoff, H. A. 1

DRILL HOLES (CORES), *see also* Wells and well logs
Bedford Co., Sherman Valley, Mississippian: Kerns, W.H. 1
Blair Co., Sinking Valley area, Ordovician: Reed, D.F. 1
Chester Co., Pickering Creek lead-zinc mines: Reed, D.F. 2
Cumberland Co.
Boiling Springs area, Cambrian: Burton, S.E. 1
White Rocks area, residual manganese-bearing clay: Foose, R.M. 14
Huntingdon Co., Critchfield mine: Kerns, W.H. 2
Lancaster Co., Wood chrome mine: McIntosh, F.K. 1

DRUMLINS, *see also* Glacial geology
Northampton Co.: Williams, E.H. 3
Tioga Co., Elkland-Tioga quadrangles: Fuller, M.L. 3

EARTHFLOW
Southwestern: Sharp, C.F.S. 1

EARTHQUAKES
Berks-Dauphin Cos.: Neumann, F. 1
Blair Co.: Anon. 47; Landsberg, H. 2; Neumann, F. 1
Erie-Mercer Cos.: Neumann, F. 1
Lackawanna Co.: Bodle, R.R. 1
Lancaster Co.: Anon. 1; Bodle, R.R. 1
Pennsylvania: Landsberg, H. 1
popular: Anon. 60; Stone, R.W. 57

ECHINODERMATA, *see also* individual groups
Warren Co., Devonian-Mississippian: Cooper, G.A. 1
York Co., Cambrian: Resser, C.E. 3

ELEPHANTS, *see* Mammalia

ELK COUNTY, *see also* Pennsylvania, Pennsylvania-Northwestern, and Pennsylvania-Western
Areal geology
Elk Co.: Ashburner, C.A. 28
Economic geology
coal, bituminous: Ashburner, C.A. 28; Jackson, C.T. 1, 2; Sisler, J.D. 8, 27
fire clay: Ashburner, C.A. 28
natural gas: Ashburner, C.A. 28; Cathcart, S.H. 9
petroleum: Carll, J.F. 4, 9
Historical geology
Devonian-Mississippian: Ashburner, C.A. 8; Chance, H.M. 5
Devonian-Pennsylvanian: Ashburner, C.A. 16, 28; Carll, J.F. 4, 9; Cathcart, S.H. 9
Pennsylvanian: Jackson, C.T. 2
Maps
Economic, petroleum: Carll, J.F. 4
Geologic: Ashburner, C.A. 28; Lesley, J.P. 46, 47
Structure: Cathcart, S.H. 9; Lesley, J.P. 51
fold axes: Ashburner, C.A. 28

EMERYLITE, *see* Margarite

ENGINEERING GEOLOGY
Fayette Co., Youghiogheny dam: Philbrick, S.S. 1
Northampton Co., rock structure and blasting: Plank, W.B. 1
Pennsylvania, road-building material: Ihlseng, M.C. 2
Pennsylvania turnpike
geologic problems, popular: Cleaves, A.B. 6
tunnel geology: Cleaves, A.B. 4
Philadelphia Co., sand and gravel: Blodgett, J.B. 1

- Western, cyclothems and dam design: Philbrick, S.S. 2

EPIDESMINE, *see* Zeolites

EPIDOTE
- Montgomery Co.: Thomas, C.A. 7
- (pistazite), Philadelphia Co.: Silliman, B. 1
- Southeastern: Stone, R.W. 47

EPSOMITE
- Huntingdon Co.: Lewis, H.C. 4

ERIE COUNTY, *see also* Pennsylvania, Pennsylvania-Northwestern, and Pennsylvania-Western
- *Areal geology*
  - Erie Co.: White, I.C. 9
- *Economic geology*
  - natural gas: White, I.C. 9
    - Corry area: Johnson, M.E. 2
  - petroleum: Carll, J.F. 4
  - stone: White, I.C. 9
- *Ground water*
  - Erie Co.: Leggette, R.M. 1
- *Historical geology*
  - Cambrian-Pennsylvanian: Torrey, P.D. 3
  - Devonian-Pennsylvanian: Carll, J.F. 4
  - Devonian-Pleistocene: White, I.C. 9
- *Maps*
  - Geologic: Lesley, J.P. 46, 47; White, I.C. 9
- *Paleontology*
  - ammonoids, Devonian: Miller, A.K. 1
  - brachiopods, Devonian: Simpson, G.B. 2
  - mastodon tooth, Quaternary: Van Rensselaer, J. 1
  - pteropod, Devonian: Williams, H.S. 3
  - sponges, Devonian: Clarke, J.M. 6
- *Petrology*
  - cone-in-cone structure, Devonian: Gresley, W.S. 3
- *Physical geology*
  - earthquakes: Neumann, F. 1
  - folds: Hopkins, T.C. 12
- *Physiography*
  - glacial beaches and moraines: Leverett, F. 6
  - glacial geology: White, I.C. 9
  - Presque Isle
    - hooks: Wilson, A.W.G. 1
    - origin: Ingersoll, T.O. 1

ERYTHRITE
- Chester Co.: Lewis, H.C. 39

ESKERS, *see also* Glacial geology
- Tioga Co., Elkland-Tioga quadrangles: Fuller, M.L. 3

EUPHYLLITE, *see* Mica

EURYPTERIDA
- Beaver Co., Pennsylvanian: Hall, C.E. 3; Hall, J. 7; Mansfield, I.F. 1
- McKean Co., Devonian: Ehlers, G.M. 1
- Pennsylvania, Paleozoic: Clarke, J.M. 4
- Potter Co., Devonian: Willard, B. 12
- Venango Co.
  - Mississippian: Hall, J. 7
  - Pennsylvanian: Hall, C.E. 3; Hall, J. 6
- Warren Co., Devonian: Claypole, E.W. 7; Hall, J. 6, 7

EUXENITE, *see also* Radioactive minerals
- Delaware Co.: Law, E.S. 3; Wherry, E.T. 2

FAHLUNITE, *see* Cordierite

FAULTS AND FAULTING, *see also* Thrusts and thrusting
- Adams Co.
  - Blue Ridge area: Stose, G.W. 13
  - Triassic: Stose, G.W. 47
- Blair Co.: Butts, C. 12; Platt, F. 15
- Carbon Co.
  - anthracite region: Wasmuth, H.A. 4
  - normal: Brown, E.A. 1
- Central: Ashley, G.H. 2
  - Nittany arch: Parker, J.M. 1
- Chester-Lancaster Cos., block-faulted folds: Stose, G.W. 20
- Dauphin Co.
  - anthracite region: Wasmuth, H.A. 4
  - Kittatinny-Little Mts.: Foose, R.M. 1
  - reverse: Cloos, E. 4
- Lackawanna-Luzerne Cos., Northern anthracite basin: Darton, N.H. 11
- Lancaster Co., Chickies Rock: Foose, R.M. 18
- Luzerne Co., Wyoming Valley: Ashburner, C.A. 36
- Northampton Co.
  - Camelhump area: Petersen, R.G. 1
  - slate belt: Behre, C.H. 3
- Northeastern
  - anthracite fields: Ashburner, C.A. 25; Kemp, J.F. 9; Lyman, B.S. 8; Wasmuth, H.A. 1
  - models: Taylor, R.C. 8
- Northern: Cathcart, S.H. 7
- Pennsylvania: Hietanen, A.M. 1; Willis, B. 2, 3
- Perry Co.: Claypole, E.W. 16
  - New Bloomfield-New Germany faults: Claypole, E.W. 15
  - reverse: Cloos, E. 4

- Philadelphia Co., Recent: Rand, T.D. 1
- Southeastern, Triassic: McLaughlin, D.B. 4
- Tioga Co., Farmington gas field: Sanders, T.P. 1
- York Co.: Frazer, P. 4; Jonas, A.I. 12

FAYETTE COUNTY, *see also* Pennsylvania, Pennsylvania-Southwestern, and Pennsylvania-Western
- engineering problems, Youghiogheny dam: Philbrick, S.S. 1

Areal geology
- Accident-Grantsville quadrangles: Martin, G.C. 3
- Brownsville-Connellsville quadrangles: Campbell, M.R. 2
- Fayette Co.: Hickok, W.O. 10; Moyer, F.T. 2
- generalized: D'Invilliers, E.V. 9
- Ligonier Valley: Stevenson, J.J. 5
- Masontown-Uniontown quadrangles: Campbell, M.R. 1
- Waynesburg quadrangle: Stone, R.W. 4
- western: Stevenson, J.J. 4

Economic geology
- cement: Stevenson, J.J. 5
  - Uniontown quadrangle: Campbell, M.R. 1
- clay: Hickok, W.O. 10; Leighton, H. 5, 9; Stevenson, J.J. 5
  - Accident-Grantsville quadrangles: Martin, G.C. 3
  - Masontown-Uniontown quadrangles: Campbell, M.R. 1
- coal, bituminous: Hickok, W.O. 10; Platt, F. 3; Sisler, J.D. 9, 27; Stevenson, J.J. 4, 5; Wall, J.S. 1
  - Accident-Grantsville quadrangles: Martin, G.C. 3
  - Brownsville-Connellsville quadrangles: Campbell, M.R. 2
  - Masontown-Uniontown quadrangles: Campbell, M.R. 1
  - reserves: Reese, J.F. 6
- fire clay: Hickok, W.O. 10; Leighton, H. 9; Platt, F. 3
- iron: Hickok, W.O. 10; Platt, F. 3; Stevenson, J.J. 4, 5
  - Accident-Grantsville quadrangles: Martin, G.C. 3
- lead: Stevenson, J.J. 5
  - analyses: McCreath, A.S. 3
- limestone: Hickok, W.O. 10; Stevenson, J.J. 5
  - Brownsville-Connellsville quadrangles: Campbell, M.R. 2
- natural gas: Fettke, C.R. 23; Gibbs, H.S. 1; Hickok, W.O. 10; Stevenson, J.J. 5
  - Brownsville-Connellsville quadrangles: Campbell, M.R. 2
  - Masontown quadrangle: Campbell, M.R. 1
- petroleum: Carll, J.F. 9; Gibbs, H.S. 1; Hickok, W.O. 10
  - Masontown quadrangle: Campbell, M.R. 1
- salt: Stevenson, J.J. 5
- sand, Brownsville-Connellsville quadrangles: Campbell, M.R. 2
- sand and gravel: Hickok, W.O. 10
- sandstone: Hickok, W.O. 10
- shale: Hickok, W.O. 10
  - Accident-Grantsville quadrangles: Martin, G.C. 3
- stone: Stevenson, J.J. 5
  - Accident-Grantsville quadrangles: Martin, G.C. 3
  - Brownsville quadrangle: Campbell, M.R. 2
  - Masontown-Uniontown quadrangles: Campbell, M.R. 1
- zinc: Stevenson, J.J. 5
  - analyses: McCreath, A.S. 3

Ground water
- Accident-Grantsville quadrangles: Martin, G.C. 1
- Fayette Co.: Hickok, W.O. 10; Piper, A.M. 1

Historical geology
- Devonian, Chemung Formation: Willard, B. 14
- Devonian-Pennsylvanian: Stevenson, J.J. 5
  - Accident-Grantsville quadrangles: Martin, G.C. 3
  - Ligonier Valley: Stevenson, J.J. 5
  - Waynesburg quadrangle: Stone, R.W. 4
- Devonian-Permian: Hickok, W.O. 10
- Devonian-Pleistocene: Moyer, F.T. 2
- Mississippian-Pennsylvanian, western: Stevenson, J.J. 4
- Mississippian-Pleistocene, Brownsville-Connellsville quadrangles: Campbell, M.R. 2
- Pennsylvanian: D'Invilliers, E.V. 6
  - Masontown-Uniontown quadrangles: Campbell, M.R. 1

Maps
- Economic
  - Accident-Grantsville quadrangles, mineral resources: Martin, G.C. 3
  - Brownsville quadrangle, mineral resources: Campbell, M.R. 2

    - coal, bituminous: Hogg, J.B. 1; Platt, F. 3; Wall, J.S. 1
        - Masontown-Uniontown quadrangles, mineral resources: Campbell, M.R. 1
        - Waynesburg quadrangle, mineral resources: Stone, R.W. 4
- Geologic: D'Invilliers, E.V. 6; Hickok, W.O. 10; Lesley, J.P. 46, 47; Stevenson, J.J. 5
    - Accident-Grantsville quadrangles: Martin, G.C. 3
    - Brownsville-Connellsville quadrangles: Campbell, M.R. 2
    - Masontown-Uniontown quadrangles: Campbell, M.R. 1
    - Waynesburg quadrangle: Stone, R.W. 4
    - western: Stevenson, J.J. 4
- Structure: Hickok, W.O. 10; Moyer, F.T. 2
    - Accident-Grantsville quadrangles: Martin, G.C. 3
    - Brownsville quadrangle: Campbell, M.R. 2
    - Masontown-Uniontown quadrangles: Campbell, M.R. 1
- Structure contour
    - Accident-Grantsville quadrangles, Pottsville sandstone, Pennsylvanian: Martin, G.C. 3
    - Brownsville quadrangle, Pittsburgh coal: Campbell, M.R. 2
    - Masontown-Uniontown quadrangles, Pottsville sandstone, Pennsylvanian: Campbell, M.R. 1
    - Waynesburg quadrangle, Pittsburgh coal: Stone, R.W. 4

Mineralogy
- siderite: Lewis, H.C. 6

Paleontology
- brachiopods, Mississippian, Greenbrier limestone: Benson, F.M. 1
- Devonian, Chemung Formation: Willard, B. 14
- mammoth, Quaternary: Price, P.H. 3
- nautiloid, Mississippian: Miller, A.K. 4
- plants, Devonian, Catskill Formation: Arnold, C.A. 9

Petrology
- clay dikes in coal: Price, P.H. 2
- Homewood sandstone, Pennsylvanian: Jackson, A.M. 1
- peridotite: Kemp, J.F. 7; Smith, L.B. 1
    - Gates mine, intrusion temperatures: Sosman, R.B. 1
- Pittsburgh coal, Pennsylvanian: Fieldner, A.C. 3

Physical geology
- folds, Pittsburgh coal: D'Invilliers, E.V. 6
- structural trends: Sisler, J.D. 9
- structure: Stevenson, J.J. 4

Physiography
- glacial geology, Masontown-Uniontown quadrangles: Campbell, M.R. 1
- terraces, Pleistocene: Stevenson, J.J. 5
- waterfalls, Youghiogheny River, origin: Hutchins, T. 1

FELDSPAR
- albite
    - Centre Co., authigenic: Honess, A.P. 5
    - Chester Co.: Silliman, B., Jr. 3
    - Delaware Co.: Genth, F.A. 28; Lea, I. 14
    - Lancaster Co.: Silliman, B., Jr. 3
    - Southeastern: Rose, G. 1
- Chester Co.: Hopkins, T.C. 5, 6; Lea, I. 14; Morton, S.G. 1; Stone, R.W. 29, 47; Watts, A.S. 1
    - Phoenixville quadrangle: Bascom, F. 21
- Delaware Co.: Bastin, E.S. 1; Hopkins, T.C. 6; Lea, I. 14; Stone, R.W. 29, 47; Watts, A.S. 1; Willcox, J. 2
    - Chester quadrangle: Bascom, F. 9
- hyalophane, Delaware Co.: Meier, A.E. 2
- Lancaster Co.: Hopkins, T.C. 5
- microcline
    - chesterlite, Chester Co.: McKinstry, H.E. 2; Smith, J.L. 1
    - chesterlite-talc, Chester Co.: Smith, J.L. 1
- Montgomery Co.: Carter, O.C.S. 3; Stone, R.W. 29
- Northampton Co.: Eyerman, J. 6
- oligoclase
    - Chester Co.: Smith, J.L. 1
    - Philadelphia Co.: Rand, T.D. 3
    - (sunstone), Chester Co.: Lea, I. 14
- orthoclase
    - (cassinite)
        - Chester Co.: Lea, I. 14
        - Philadelphia Co.: Rand, T. D. 3
        - Chester Co.: Eyerman, J. 2; Genth, F.A. 22; Smith, J.L. 1
    - Delaware Co.: Leeds, A.R. 2
    - (delawarite), Chester-Delaware Cos.: Lea, I. 14
    - (lennilite)
        - Delaware Co.: Lea, I. 14
        - Philadelphia Co.: Rand, T.D. 3
    - (moonstone), Delaware Co.: Leeds, A.R. 9
- Philadelphia Co.: Rand, T.D. 3
- Southeastern: Ashley, G.H. 24, 76

FIRE CLAY, *see also* Clay
- Armstrong Co.: Platt, W.G. 2
- Bedford-Fulton Cos.: Stevenson, J.J. 8
- Cambria Co.: Platt, F. 4
- Clearfield-Jefferson Cos.: Platt, F. 1
  - iron content: Leatham, E. 1
- Clinton Co.: Platt, F. 13
- Elk Co.: Ashburner, C.A. 28
- Fayette Co.: Hickok, W.O. 10; Leighton, H. 9; Platt, F. 3
- Pennsylvania: Chelikowski, J.R. 1; Shaw, J.B. 1
  - analyses: McCreath, A.S. 1, 5
  - distribution and reserves: Ashley, G.H. 30
- Somerset Co.: Lesley, J.P. 55
  - Salisbury basin: Prosser, A.G. 1
- Tioga Co.: Taylor, R.C. 6
- Western: Morganroth, L.C. 2
- Westmoreland Co.: Platt, F. 3

FLINT, *see also* Chert
- Chester Co., Phoenixville quadrangle: Bascom, F. 21
- Lancaster Co., Honeybrook quadrangle: Bascom, F. 21

FLUORITE
- Centre Co., Bellefonte quadrangle: Butts, C. 16
- Chester Co.: Jefferies, M.M. 3; Smith, J.L. 1; Whitlock, H.P. 1
- Lehigh Co.: Smith, E.F. 2
- York Co.: Ehrenfeld, C.H. 1

FOLDS AND FOLDING
- Crawford Co., landslides: Smallwood, W.M. 1
- Erie Co.: Hopkins, T.C. 12
- Huntingdon Co., Broad Top area: Roeder, J.H. 1
- Lackawanna-Luzerne Cos., Northern anthracite basin: Darton, N.H. 11
- Lancaster Co., Chickies Rock: Foose, R.M. 18
- Lehigh-Northampton Cos., Taconic: Behre, C.H. 2
- Northampton Co., slate belt: Behre, C.H. 3
- Northeastern
  - anthracite fields: Ashburner, C.A. 25; Lyman, B.S. 8
  - models: Taylor, R.C. 8
- Northern: Cathcart, S.H. 7
- Northwestern, minor: Decker, C.E. 1
- Pennsylvania: Hietanen, A.M. 1
  - mechanics: Ashley, G.H. 8; Willis, B. 3
  - origin: Rogers, H.D. 6; Sherrill, R.E. 6
- Southeastern
  - axial trends: Cloos, E. 1
  - Blue Ridge, oolite deformation: Cloos, E. 6
  - Ordovician: Miller, B.L. 17
  - Precambrian: Miller, W.J. 1
  - Taconic: Schuchert, C. 11
- Western: Butts, C. 1
  - Devonian: Sherrill, R.E. 3
  - foreland: Sherrill, R.E. 1
- York-Lancaster Cos., recumbent: Jonas, A.I. 15

FOREST COUNTY, *see also* Pennsylvania, and Pennsylvania-Western

Areal geology
- Forest Co.: Ashburner, C.A. 29

Economic geology
- coal, bituminous: Ashburner, C.A. 29; Sisler, J.D. 14, 27
- natural gas
  - Oil City quadrangle: Dickey, P.A.
  - Tidioute quadrangle: Cathcart, S.H. 13
  - Titusville quadrangle: Dickey, P.A. 6
- petroleum: Carll, J.F. 4, 9; Dickey, P.A. 2
  - Oil City quadrangle: Dickey, P.A. 4, 5
  - Tidioute quadrangle: Cathcart, S.H. 13
  - Titusville quadrangle: Dickey, P.A. 6

Historical geology
- Devonian, Titusville quadrangle: Dickey, P.A. 2
- Devonian-Mississippian: Chanee, H.M. 5
  - Oil City quadrangle: Dickey, P.A. 5
  - Titusville quadrangle: Dickey, P.A. 6
- Devonian-Pennsylvanian: Ashburner, C.A. 28, 29
  - Oil City quadrangle: Dickey, P.A. 4
  - Tidioute quadrangle: Cathcart, S.H. 13
- Pennsylvanian: Ashburner, C.A. 29

Maps
- Economic
  - natural gas
    - Oil City quadrangle: Dickey, P.A. 5
    - Tidioute quadrangle: Cathcart, S.H. 13
    - Titusville quadrangle: Dickey, P.A. 6
  - petroleum: Carll, J.F. 4
    - Oil City quadrangle: Dickey, P.A. 5
    - Tidioute quadrangle: Cathcart, S.H. 13
    - Titusville quadrangle: Dickey, P.A. 6; Sherrill, R.E. 7
- Geologic: Ashburner, C.A. 29; Lesley, J.P. 46, 47

Structure: Lesley, J.P. 51
fold axes: Ashburner, C.A. 28
Tidioute quadrangle: Cathcart, S.H. 13
Structure contour
Oil City quadrangle, Devonian sands: Dickey, P.A. 4
Tidioute quadrangle, Devonian sands: Cathcart, S.H. 13
Titusville quadrangle, Devonian sands: Dickey, P.A. 2

Physiography
Allegheny River
drainage changes: Wright, G.F. 14
terraces: Wright, G.F. 10

FRANKLIN COUNTY, *see also* Pennsylvania, Pennsylvania-Central, Pennsylvania-Southcentral, and Pennsylvania-Southeastern

Areal geology
Blue Ridge area: Bascom, F. 1; Keith, A. 1
Chambersburg-Mercersburg quadrangles: Stose: G.W. 10
Dry Run area: Curtis, L.W. 1
Fairfield quadrangle: Stose, G.W. 27
Hancock quadrangle: Stose, G.W. 12

Economic geology
abrasives, Fairfield quadrangle: Stose, G.W. 27
barite: Stone, R.W. 47; Stose, G.W. 2; Tooker, E.W. 1
Chambersburg quadrangle: Stose, G.W. 10
cement, Hancock quadrangle: Stose, G.W. 12
clay, Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
copper: Bevier, G.M. 1; Blandy, J.F. 2; Henderson, C.H. 1; Stose, G.W. 11; Wherry, E.T. 7
Fairfield quadrangle: Stose, G.W. 27
iron: D'Invilliers, E.V. 8; Frazer, P. 20; Harden, J.W. 1; Lesley, J.P. 6
Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
Fairfield quadrangle: Stose, G.W. 27
limestone: D'Invilliers, E.V. 8
Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
Hancock quadrangle: Stose, G.W. 12
manganese, Fairfield quadrangle: Stose, G.W. 27
marl: Dickey, F.B.R. 1
quartz, Fairfield quadrangle: Stose, G.W. 27
roofing granules, Fairfield quadrangle: Stose, G.W. 27
sand, Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
sand and gravel, Fairfield quadrangle: Stose, G.W. 27
serpentine, Fairfield quadrangle: Stose, G.W. 27
stone
Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
Fairfield-Gettysburg quadrangles: Stose, G.W. 27

Ground water
Chambersburg-Mercersburg quadrangles: Stose, G.W. 4, 10

Historical geology
Cambrian: Walcott, C.D. 5
Cambrian-Ordovician: Stose, G.W. 6
Cambrian-Quaternary: Mercersburg quadrangle: Stose, G.W. 10
Cambrian-Tertiary, Hancock quadrangle: Stose, G.W. 12
Ordovician, bentonite: Whitcomb, L. 5
Precambrian-Cambrian, Fairfield quadrangle: Stose, G.W. 27
Precambrian - Quaternary, Chambersburg quadrangle: Stose, G.W. 10
Precambrian-Triassic: Keith, A. 1

Maps
Economic
copper, Blue Ridge area: Bevier, G.M. 1
Fairfield quadrangle, mineral resources: Stose, G.W. 27
iron: D'Invilliers, E.V. 8; McCreath, A.S. 5
limestone: D'Invilliers, E.V. 8
Geologic: Lesley, J.P. 46, 47; Sanders, R.H. 1
Blue Ridge copper district: Wherry, E.T. 7
Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
Fairfield quadrangle: Stose, G.W. 27
Hancock quadrangle: Stose, G.W. 12
Structure
Fairfield quadrangle: Stose, G.W. 27
Hancock quadrangle: Stose, G.W. 12

Mineralogy
barite: Lewis, H.C. 20
piedmontite: Williams, G.H. 3
scheelite: Williams, G.H. 3

Paleontology
crustacean, Ordovician: Ruedemann, R. 2
mammoth, Quaternary: Barton, B.S. 1
trilobite, Ordovician: Howell, B.F. 7
worms, Cambrian: Cloud, P.E. 1

Petrology
aporhyolite, Blue Ridge area: Bascom, F. 2, 5
basalt: Williams, G.H. 2

- breccia: Williams, G.H. 2
- dolomite, analyses: McCreath, A.S. 4
- lignite: Lesley, J.P. 6
- oolite, deformation: Cloos, E. 2
- rhyolite: Williams, G.H. 2
- tuff: Williams, G.H. 2
- volcanic rocks, Blue Ridge area: Bascom, F. 4

Physical geology
- rock flowage, oolites: Cloos, E. 2
- structure, Blue Ridge area: Cloos, E. 6; Stose, G.W. 1, 6

Physiography
- drainage patterns, shale and limestone areas: Sharp, H.S. 1
- peneplains: Keith, A. 1; Stose, G.W. 3

FUCHSITE, *see* Muscovite

FUCOIDS
- Berks Co., Cambrian: Haldeman, S.S. 1
- Lancaster Co., Cambrian: Haldeman, S.S. 1
- Lawrence Co., Pennsylvanian: Lesquereux, L. 9
- Mifflin Co., Silurian: Harlan, R. 1; James, J.F. 2, 3; Taylor, R.C. 2, 3
- York Co., Ordovician: Lesley, J.P. 32

FULTON COUNTY, *see also* Pennsylvania, and Pennsylvania-Central

Areal geology
- Fulton Co.: Stevenson, J.J. 8
- Hancock-Pawpaw quadrangles: Stose, G.W. 12
- Mercersburg quadrangle: Stose, G.W. 10

Economic geology
- barite: Stone, R.W. 47
- cement, Hancock-Pawpaw quadrangles: Stose, G.W. 12
- coal, bituminous: Stevenson, J.J. 8
  - Broadtop basin: Gardner, J.H. 1
- fire clay: Stevenson, J.J. 8
- iron: Dewees, J.H. 1; Stevenson, J.J. 8
- limestone: Stevenson, J.J. 8
  - Hancock-Pawpaw quadrangles: Stose, G.W. 12
  - Mercersburg quadrangles; Stose, G.W. 10
- marl: Dickey, F.B.R. 1
- stone: Stevenson, J.J. 8

Ground water
- Hancock quadrangle: Stose, G.W. 5
- Mercersburg quadrangle: Stose, G.W. 4, 10

Historical geology
- Cambrian-Quaternary, Mercersburg quadrangle: Stose, G.W. 10
- Cambrian-Tertiary, Hancock quadrangle: Stose, G.W. 12
- Ordovician-Pennsylvanian: Stevenson, J.J. 8
- Ordovician-Tertiary, Pawpaw quadrangle: Stose, G.W. 12
- Pennsylvanian-Permian, Broadtop basin: Gardner, J.H. 1

Maps
- Geologic: Lesley, J.P. 46, 47; Stevenson, J.J. 8
  - Broadtop basin: Gardner, J.H. 1
  - Hancock-Pawpaw quadrangles: Stose, G.W. 12
  - Mercersburg quadrangle: Stose, G.W. 10
  - Sideling Hill Creek area: Dewees, J.H. 1
- Structure, Hancock-Pawpaw quadrangles: Stose, G.W. 12
- Structure contour, Broadtop field, Kelly coal: Gardner, J.H. 1

Paleontology
- Pennsylvanian, fauna-flora: Gardner, J.H. 1

Physical geology
- structure: Stevenson, J.J. 8

GABBRO
- Chester Co., serpentine belt: Chester, F.D. 2
- Delaware Co., alteration: Watson, E.H. 3
- Lancaster Co.: Leonard, A.C. 1
- Philadelphia Co.
  - alteration: Watson, E.H. 3
  - boulders in schist: Leeds, A.R. 3
- Southeastern: Bascom, F. 20

GABBRO-PHONOLITE
- Bucks-Delaware Cos.: Goldsmith, E. 1
- Montgomery Co.: Goldsmith, E. 3

GAHNITE
- Delaware Co.: Genth, F.A. 25

GALENA
- Armstrong Co.: Hamilton, H.V. 1
- Chester Co.: Blake, W.P. 2; Smith, J.L. 1
- Lebanon Co.: Brush, G.J. 1; Torrey, J. 1
- Montgomery Co.: Boucot, A.J. 1

GANISTER, *see* Stone

GARNET
- andradite, Lebanon Co.: Eyerman, J. 1
- Bucks Co., Morton, S.G. 1
- Chester Co.: Jefferies, M.M. 4; Vaux, G. 2

  Delaware Co.: Cardeza, J.M. 2; Eyerman, J. 6; Keller, H.A. 1; Law, E.S. 1; Robinson, W.C. 1; Strock, L.W. 2
  (grossularite); Delaware Co.: Koenig, G.A. 3
  Lehigh Co.: Smith, E.F. 2
  (melanite) Philadelphia Co.: Wister, C.I. 1
  Philadelphia Co.: Carpenter, G.W. 1; Robinson, W.C. 1
  York Co.: Stose, G.W. 37, 38, 39

GAS, *see* Natural gas

GASTROPODA
  Cambria Co., Pennsylvanian: Conrad, T.A. 1
  Centre Co., Ordovician: Collie, G.L. 1
  Crawford Co., Pleistocene marl: Brooks, S.T. 1
  Huntingdon Co., Mississippian, Pocono Formation: Girty, G.H. 3
  Lancaster Co., Cambrian: Resser, C.E. 3
  Luzerne Co., Pennsylvanian: Ashburner, C.A. 35; Claypole, E.W. 20; Miller, S.A. 1
  Northwestern, Devonian-Mississippian: Caster, K.E. 1
  Pennsylvania
    Devonian: Willard, B. 39
    Ordovician-Devonian: Conrad, T.A. 3
  York Co., Triassic: Warren, H.E. 1

GENTHITE
  Lancaster Co.: Genth, F.A. 3
  Montgomery Co.: Lewis, H.C. 39

GEOLOGIC FORMATIONS, *see also* Type sections, and History, and Various periods
  Allegheny Formation, Pennsylvanian, Western: Swartz, C.K. 1
  Allentown limestone, Ordovician, Southeastern: Buie, B.F. 1
  Bald Eagle conglomerate, Ordovician, Pennsylvania: Willard, B. 60
  Bellefonte sandstone, Ordovician, Centre Co.: Krynine, P.D. 5
  Berea sandstone, Mississippian
    Southwestern: Pepper, J.F. 1
    Western: Demarest, D.F. 1; Rittenhouse, G. 1; Ver Wiebe, W.A. 1
  Bradford sand, Devonian
    clay content: Bates, T.F. 1
    McKean Co.: Ashburner, C.A. 12; Fettke, C.R. 10; Waldo, A.W. 1
    Tioga Co.: Krynine, P.D. 4
  Bradfordian series, Devonian-Mississippian, Northwestern: Caster, K.E. 7
  Brookville coal, Pennsylvanian, Jefferson Co.: Foose, R.M. 5
  Brunswick shale, Triassic, Bucks-Montgomery Cos.: McLaughlin, D.B. 2
  Brush Creek limestone, Pennsylvanian, Western: Seaman, D.M. 4
  Bryn Mawr gravel, Tertiary, Southeastern: Bascom, F. 15; Lewis, H.C. 14
  Byham limestone, Mississippian, Northwestern: Caster, K.E. 5
  Byram gneiss, Precambrian
    Lehigh Co.: Fraser, D.M. 16
    Northampton Co.: Fraser, D.M. 12
  Cambridge limestone, Pennsylvanian, Western: Seaman, D.M. 3
  Cameron red shale, Mississippian, Northwestern: Caster, K.E. 5
  Canal limestone, Pennsylvanian, Luzerne Co.: Ashburner, C.A. 35
  Catskill Formation, Devonian: Chadwick, G.H. 2; Stevenson, J.J. 12
    considered Mississippian: Prosser, C.S. 1
    Northeastern: Willard, B. 31
    Northern: Fuller, M.L. 1
  Chemung Formation, Devonian: Stevenson, J.J. 12
    Southwestern: Willard, B. 14
  Cobham conglomerate, Mississippian, Northwestern: Caster, K.E. 5
  Conestoga limestone, Ordovician, Southeastern: Jonas, A.I. 14; Stose, G.W. 19
  Cordiola shale, Devonian, Perry Co.: Claypole, E.W. 11
  Custards shale, Mississippian, Northwestern: Caster, K.E. 5
  Dexterville shale, Devonian, Northwestern: Caster, K.E. 5
  East Kane shale, Mississippian, Northwestern: Caster, K.E. 5
  Ellicot shale, Devonian, Northwestern: Caster, K.E. 5
  Franklin limestone, Precambrian
    Lehigh Co.: Fraser, D.M. 16
    Northampton Co.: Fraser, D.M. 12
  French Creek limestone, Mississippian, Northwestern: Caster, K.E. 5
  Gatesburg Formation, Cambrian, Central: Pelts, C.R. 1
  Glenarm series, Precambrian, Southeastern: Knopf, E.F.B. 2
    age debate: Mackin, J.H. 3
    metamorphism: McKinstry, H.E. 4
  Greenbrier limestone, Mississippian, Southwestern: Rittenhouse, G. 4
  Hamilton group, Devonian: Willard, B. 37
    Central: Willard, B. 24
    Eastern: Willard, B. 17
  Hardyston Formation, Cambrian
    Lehigh Co.: Miller, B.L. 43
    Northampton Co.: Miller, B.L. 32

  Northampton-Lehigh Cos.: Myers, P.B. 1; Peck, F.B. 3; Prime, F. 7
Harvest Home shale, Mississippian, Northwestern: Caster, K.E. 5
Helderberg group, Devonian: Fischer, F.W. 1: Swartz, F.M. 10
  Central: Reeside, J.B. 1; Swartz, F.M. 1
Hempfield shale, Mississippian, Northwestern: Caster, K.E. 5
Hillman limestone, Pennsylvanian, Luzerne Co.: Ashburner, C.A. 35
Jacksonburg limestone, Ordovician
  Berks Co.: Miller, B.L. 19
  Eastern: Miller, R.L. 2
  Lehigh Co.: Miller, B.L. 19; Miller, R.L. 5
  Northampton Co.: Miller, B.L. 19; Miller, R.L. 4
Juniata Formation, Ordovician, Pennsylvania: Willard, B. 60
Kingsmill sandstone, Devonian, Perry Co.: Claypole, E.W. 5
Lillibridge sandstone, Devonian, Northwestern: Caster, K.E. 5
Littles Corner limestone, Mississippian, Northwestern: Caster, K.E. 5
Lockatong Formation, Triassic, Southeastern: Hawkins, A.C. 1
Lower Kittanning coal, Pennsylvanian, Cambria Co., petrography: Fieldner, A.C. 6
Loyalhanna limestone, Mississippian
  Washington Co.: Linn, A. 1
  Western: Butts, C. 14
McKenzie shale, Silurian
  Blair Co.: Swartz, F.M. 6
  Central: Swartz, F.M. 2
Mammoth coal, Pennsylvanian, Carbon-Schuylkill Cos.: Ashburner, C.A. 2
Martinsburg Formation, Ordovician: Willard, B. 60
  Dauphin Co.: Gorman, J.P. 1; Laird, W.M 1
  Eastern: Miller, R.L. 1
  Lebanon Co.: Stose, G.W. 24
  Lehigh Co.: Willard, B. 56
  Northampton Co.: Miler, B.L. 33
  Southeastern: Behre, C.H. 6; Hintze, F.F. 1
Mauch Chunk Formation, Mississippian: Barrell, J. 3; Stevenson, J.J. 17
  Northeastern: Brown, A.P. 3; Wistar, I.J. 1
  Somerset Co.: Stone, R.W. 41, 43
Medina Formation, Silurian: Chadwick, G.H. 3; Claypole, E.W. 22; Grabau, A.W. 8
  problem: Eaton, H.N. 5
Mill Creek limestone, Pennsylvanian, Luzerne Co.: Ashburner, C.A. 35
Monongahela Formation, Pennsylvanian, Western: Ashley, G.H. 43
Moravian Heights Formation, Precambrian
  Lehigh Co.: Fraser, D.M. 16
  Northampton Co.: Fraser, D.M. 12
Nittany dolomite, Ordovician, Centre Co.: Folk, R.L. 1
Octoraro phyllite, Ordovician, Chester Co.: Boudreau, E. 1
Onondaga limestone, Devonian: Eaton, A. 5; Kindle, E.M. 2, 3; Willard, B. 35
Oriskany sandstone, Devonian: Claypole, E.W. 22; Cleaves, A.B. 3, 5; Finn, F.H. 1; Hamilton, S.H. 3; Leighton, H.E. 1; Myers, T.H. 1; Stow, M.H. 1
  Central: Stow, M.H. 3
  Huntingdon Co.: Krynine, P.D. 1
  Lycoming Co.: Woolman, L. 1
  Northeastern: Cathcart, S.H. 7; Fettke, C.R. 19
  Northwestern: Fettke, C.R. 11
  Perry Co.: Willard, B. 4
  porosity; Krynine, P.D. 6
  Tioga Co.: Fettke, C.R. 7; Torrey, P.D. 2
Panama conglomerate, Devonian, Northwestern: Caster, K.E. 5
Peach Bottom slate
  Precambrian, Lancaster Co.: Agron, S.L. 1
  Silurian, Lancaster Co.: Stose, G.W. 45
Pensauken Formation, Quaternary, Philadelphia Co.: Campbell, M.R. 17; Strock, L.W. 17
Pittsburgh coal, Pennsylvanian
  Allegheny Co., petrography: Fieldner, A.C. 5
  Southwestern: D'Invilliers, E.V. 9; Fieldner, A.C. 4
  Western: White, I.C. 21
Pochuk gneiss, Precambrian
  Lehigh Co.: Fraser, D.M. 16
  Northampton Co.: Fraser, D.M. 16
Pocono Formation, Mississippian: Ashley, G.H. 57; Claypole, E.W. 22; Halberstadt, B. 4; White, C.D. 13
  Armstrong Co.: Campbell, M.R. 4
  Bedford-Huntingdon Cos.: Reger, D.B. 1
  Northeastern: Wilard, B. 31
  Northern: Chadwick, G.H. 4
Portage group, Devonian: Willard, B. 29
Pottsville congomerate, Pennsylvanian: Branner, J.C. 1; Chance, H.M. 8; Claypole, E.W. 22; Platt, F. 8; White, C.D. 8

- Queenston shale, Ordovician, Western: Rittenhouse, G. 6
- Ridgely sandstone, Devonian: Cleaves, A.B. 3
- Robeson conglomerate, Triassic, Berks Co.: McLaughlin, D.B. 3
- Rochester shale, Silurian, Blair Co.: Swartz, F.M. 6
- Sadsbury steatite, Chester-Lancaster Cos.: Rand, T.D. 22
- Sharon conglomerate, Pennsylvanian, Northwestern: White, I.C. 8
- Sharpsville sandstone, Mississippian, Northwestern: Caster, K.E. 5
- Shawangunk Formation, Silurian, Northwestern: Billingsley, P. 1; Grabau, A.W. 8; Willard, B. 1
- Shaws sandstone, Mississippian, Northwestern: Caster, K.E. 5
- Shriver chert, Devonian: Cleaves, A.B. 3
- Sliverville sand, Devonian, McKean Co.: Fettke, C.R. 25
- Spitzenberg conglomerate, Triassic, Berks Co.: Whitcomb, L. 4, 8
- Taconic sequence, Ordovician, Southeastern: Stose, G.W. 44
- Tidioute shale, Mississippian, Northwestern: Caster, K.E. 5
- Trenton gravel, Quaternary, Eastern: Lewis, H.C. 2
- Tully limestone, Devonian: Willard, B. 39
  - Central: Cooper, G.A. 3
  - Northeastern: Skinner, W.S. 1; Stevenson, R.E. 2
  - Northumberland Co.: Willard, B. 18
- Tuscarora Formation, Silurian: Ulrich, E.O. 4
- Upper Kittanning coal, Pennsylvanian, Cambria Co.: Fieldner, A.C. 6
- Vanport limestone, Pennsylvanian
  - Butler-Venango Cos.: Fettke, C.R. 6
  - Lawrence Co.: Peck, F.B. 10
- West Mead limestone, Missisippian, Northwestern: Caster, K.E. 5
- Wetmore conglomerate, Mississippian, Northwestern: Caster, K.E. 5
- Wissahickon schist, Precambrian
  - Bucks Co.: Weiss, J. 3
  - Chester Co.: Dike, P.A. 1
  - Philadelphia Co.: Ch'Ih, Chi Sang, 1; Weiss, J. 3
  - Southeastern: Postel, A.W. 5

GEOLOGIC MAPS, *see* Maps, *geologic*

GEOMORPHOLOGY, *see* Physiography

GEOPHYSICAL INVESTIGATIONS
- electrical resistivity, Centre Co., Penn's cave: Keller, F. 1
- gravity
  - Berks-Bucks Cos.: regional survey: Hersey, J.B. 2
  - Bucks-Northampton Cos.: Hersey, J.B. 1
  - Eastern: Woollard, G.P. 3
    - Appalachia: Thom, W.T. 1
    - structural control: Woollard, G.P. 2
  - Lehigh-Northampton Cos., regional survey: Hersey, J.B. 2
  - Pennsylvania: Nettleton, L.L. 1; Woollard, G.P. 1, 4, 5, 6
    - crustal warping: Glennie, E.A. 1
- magnetic
  - Bucks-Northampton Cos.: Hersey, J.B. 1
  - Centre-Clearfield Cos.: Joesting, H.R. 1; Pirson, S.J. 1
  - Northampton Co.: Ewing, W.M. 1
  - Southeastern: Swartz, F.M. 21
  - York Co.: Neumann, G.L. 1
- seismic, Northampton Co.: Ewing, W.M. 2

GEOSYNCLINE, APPALACHIAN
- Pennsylvania: Kay, G.M. 3; Schuchert, C. 8

GEYSERS
- McKean Co.: Ashburner, C.A. 10

GIBBSITE
- Chester Co.: Hermann, R. 5; Seal, T. 2

GLACIAL GEOLOGY, *see also* specific types of features
- Adams Co.: Frazer, P. 14
- Allegheny Co., erratics: Gresley, W.S. 5
- Butler Co., popular: Preston, F.W. 2
- Carbon-Monroe Cos.: Hall, C.E. 1
- Central, Susquehanna River: Bashore, H.B. 3
- Columbia Co.: White, I.C. 12
- Eastern: Williams, E.H. 9
  - Delaware River valley: Wright, G.F. 10
  - extramorainic drift: Salisbury, R.D. 1; Wright, G.F. 9
- Erie Co., beaches: Leverett, F. 6
- Huntingdon Co., Devonian: Willard, B. 23
- Lackawanna Co.: Branner, J.C. 4; Itter, H.A. 1; White, I.C. 12
  - Lackawanna valley: Branner, J.C. 2
  - striae: Branner, J.C. 5
- Lawrence Co.: White, I.C. 5
- Lehigh Co.: Williams, E.H. 1, 4
  - extramorainic drift: Williams, E.H. 3
  - Reading Prong: Williams, E.H. 2
- Luzerne Co.: Itter, H.A. 1; White, I.C. 12

  - Wyoming valley: Branner, J.C. 2; Darton, N.H. 8
- Lycoming Co.: Meyer, A. 1
- Monroe Co., Pocono Knob: Kummel, H.B. 1
- Northampton Co.: Hall, C.E. 1; Miller, B.L. 39; Prime, F. 5; Ward, F. 6
  - Delaware valley: Ward, F. 3
  - extramorainic features: Williams, E.H. 3
  - Reading Prong: Barrell, J. 1; Williams, E.H. 2
  - southern limits: Cook, G.H. 2
  - striae: Rau, A.G. 1
- Northeastern
  - high-level drift: Lesley, J.P. 40
  - striae: Rogers, H.D. 9
- Northern: Ashley, G.H. 37; Leverett, F. 3; MacClintock, P. 1
  - first phase: Williams, E.H. 13
  - Kansan: Williams, E.H. 6, 10
  - terrain attitude: Chamberlin, T.C. 3
  - "thru valleys": Anon. 44
- Northwestern: Leverett, F. 1
- Pennsylvania: Ashley, G.H. 52; Lewis, H.C. 33; Tower, W.S. 1; Wright, G.F. 5
  - drift examples, catalogue: Lewis, H.C. 42
  - drift sheets, age: Ashley, G.H. 63
  - glacial boundary: Wright, G.F. 1, 3, 4, 15
  - multiple glaciation evidence: Chamberlin, T.C. 2
  - popular: Anon. 51
  - pre-Wisconsin: Leverett, F. 5; Lewis, J.F. 1
  - succession: Chamberlin, T.C. 4
- Philadelphia Co.: Hall, C.E. 2; Lesley, J.P. 25
- Potter-Tioga Cos., Gaines quadrangle: Fuller, M.L. 4
- Schuylkill Co.: Williams, E.H. 8
- Southeastern: Williams, E.H. 5
  - extramorainic drift: Lewis, H.C. 36
  - Triassic: Wherry, E.T. 13
- Susquehanna Co.: Finch, E.H. 1; White, I.C. 10
  - striae: Thomas, D. 1
- Warren Co., history: Wright, G.F. 11
- Wayne Co.
  - Elk Mtn.: Branner, J.C. 3
  - Mt. Ararat-Sugarloaf Mtn.: Kummel, H.B. 1
- Western
  - Allegheny River valley: Wright, G.F. 10
  - erosion and oxidation: Wright, G.F. 13
  - extramorainic pebbles: Woolsey, L.H. 2
  - grooves, Beaver River: Foshay, P.M. 1
  - Ohio River valley: Wright, G.F. 10
  - pre-Wisconsin border: Williams, E.H. 7
  - southern boundary: Wright, G.F. 7
- Wyoming Co.: Branner, J.C. 4; White, I.C. 12
  - drift: Ross, W.A. 1
  - striae: Branner, J.C. 5; Corss, F. 4

GLACIAL LAKES
- Allegheny Co.: Jillson, B.C. 1
- Eagles Mere, Sullivan Co.: Ashley, G.H. 75
- Lake Cowanesque, Tioga Co.: Willard, B. 10
- Lake Harvey, Wyoming Co.: White, I.C. 12
- Lake Lesley, Blair-Centre-Clinton Cos.: Williams, E.H. 13
- Lake Leverett, Venango-Warren Cos.: Williams, E.H. 13
- Lake Marcy, Wyoming Co.: White, I.C. 12
- Lake Monongahela, Western, pre-Wisconsin: Hice, R.R. 2
- Lake Packer
  - Lehigh Co.: Miller, B.L. 44; Williams, E.H. 13
  - Lehigh-Northampton Cos.: Williams, E.H. 3
  - Northampton Co.: Miller, B.L. 39
- Lake Pittston-Nanticoke, Luzerne-Lackawanna Cos.: Itter, H.A. 1
- Lake Pymatuning, Crawford Co.: Anon. 48
- Lake Warren, Northwestern: Taylor, F.B. 1
- Lake Wright, Cameron-McKean-Warren Cos.: Williams, E.H. 13
- Lake Wynola, Wyoming Co.: White, I.C. 12
- Northern: Young, A.E. 1
- Pennsylvania, Kansan: Williams, E.H. 14
- Susquehanna Co., moraine-dammed: Wilson, J.H. 1

GLASS SAND, *see also* Sand, and Sand and gravel
- Greene Co.: Stone, R.W. 33
- Mifflin Co.: D'Invilliers, E.V. 10
- Pennsylvania: Fettke, C.R. 1

GLAUBERITE
- Adams Co.: Stose, G.W. 17
- Southeastern: Wherry, E.T. 18

GLAUCONITE
- Chester Co.: Knerr, E.B. 1

GLAUCOPHANE, *see* Amphibole

GLOBOSITE, *see* Strengite

GNEISS, *see also* Metamorphic rocks
- Bucks-Montgomery Cos.: Armstrong, E.J. 1, 2
- Chester Co., alteration by granodiorite: Postel, A.W. 1
- Eastern, Precambrian: Fraser, D.M. 14
- Lehigh-Northampton Cos.: Hall, C.E. 8
- Philadelphia Co.: Browne, P.A. 2; Rand, T.D. 4
  - stratified: Rand, T.D. 10
- Southeastern: Bascom, F. 11; Hunt, T.S. 7

GOETHITE, *see also* Iron
- Armstrong-Westmoreland Cos.: Hamilton, H.V. 1

GOLD
- Bradford Co.: Wells, H. 1
- Bucks-Montgomery Cos., Triassic: Lyman, B.S. 7
- Lancaster Co.: Genth, F.A. 4
- Montgomery Co.: Carter, O.C.S. 1; Wetherill, C.M. 1
- Pennsylvania: Corbin, J.R. 6
  - popular: Stone, R.W. 46

GOSLARITE
- Lehigh Co.: Rand, T.D. 2

GRANITE, *see also* Igneous rocks
- Delaware Co.: Postel, A.W. 2; Watson, E.H. 4
  - relation to serpentine: Meier, A.E. 4
- Philadelphia Co.: Postel, A.W. 2; Rand, T.D. 4; Stelzner, A. 1
- Southeastern: Ashley, G.H. 76

GRANODIORITE, *see also* Igneous rocks
- Chester-Delaware Cos., hydrothermal origin: Postel, A.W. 4
- Delaware Co., aplitic structures: Postel, A.W. 3
- Southeastern: Bascom, F. 20

GRAPHITE
- Berks Co.: Ihne, F.W. 1; Miller, B.L. 3, 4
- Bucks Co.: Miller, B.L. 3, 4; Morton, S.G. 1
  - Allentown quadrangle: Miller, B.L. 14
  - Trenton quadrangle: Bascom, F. 10
- Chester Co.: Beattie, H.M. 1; Ihne, F.W. 1; Frazer, P. 30; Law, E.S. 2; Miller, B.L. 3, 4
  - Phoenixville quadrangle: Bascom, F. 21
  - Pickering Creek area: Miller, B.L. 41
- Lehigh Co.: Miller, B.L. 3, 4, 44
  - Allentown quadrangle: Miller, B.L. 14
- Montgomery Co.: Carter, O.C.S. 1
- Northampton Co.: Eyerman, J. 5
  - Allentown quadrangle: Miller, B.L. 14
- Philadelphia Co., Trenton quadrangle: Bascom, F. 10
- Southeastern: Ashley, G.H. 76; Miller, B.L. 4

GRAPTOLITES
- Eastern, Ordovician-Silurian: Ruedemann, R. 5
- Southeastern, paleogeography: Moore, R.C. 1
- York Co., Ordovician: Hall, C.E. 6

GRAVEL, *see also* Sand and gravel
- Allegheny Co.: Shaw, E.W. 1
  - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
- Armstrong Co.: Shaw, E.W. 1
- Beaver Co.: Shaw, E.W. 1
  - Burgettstown quadrangle: Shaw, E.W. 3
- Bucks Co.: Klingsburg, C. 1
  - Doylestown quadrangle: Bascom, F. 17
- Central, Susquehanna River: Bashore, H.B. 3
- Clarion Co., Allegheny River: Leverett, F. 2
- Dauphin-Lancaster Cos., Tertiary: Stose, G.W. 26
- Pennsylvania: Ashley, G.H. 76
- Philadelphia Co.: Klingsburg, C. 1; Wright, G.F. 6
- Potter-Tioga Cos., Gaines quadrangle: Fuller, M.L. 4
- Southwestern, high-level: White, I.C. 16
- Washington Co., Burgettstown-Carnegie quadrangles: Shaw, E.W. 3

GREENE COUNTY, *see also* Pennsylvania, Pennsylvania-Southwestern, and Pennsylvania-Western
- well temperature measurements: Van Orstrand, C.E. 1

Areal geology
- Amity quadrangle: Clapp, F.G. 4
- Claysville quadrangle: Munn, M.J. 7
- general: D'Invilliers, E.V. 9
- Greene Co.: Stevenson, J.J. 3; Stone, R.W. 33
- Masontown quadrangle: Campbell, M.R. 1
- Rogersville quadrangle: Clapp, F.G. 5
- Waynesburg quadrangle: Stone, R.W. 4

Economic geology
- building stone: Stevenson, J.J. 3
- clay: Leighton, H. 5; Stevenson, J.J. 3; Stone, R.W. 33
  - Amity quadrangle: Clapp, F.G. 4, 6
  - Claysville quadrangle: Munn, M.J. 7

Masontown quadrangle: Campbell, M.R. 1
Waynesburg quadrangle: Stone, R.W. 4
coal, bituminous: Boileau, J.W. 1; Sisler, J.D. 11, 27; Stevenson, J.J. 3; Stone, R.W. 33; Wall, J.S. 1
Amity quadrangle: Clapp, F.G. 4, 6
Claysville quadrangle: Munn, M.J. 7
Masontown quadrangle: Campbell, M.R. 1
reserves: Reese, J.F. 7
Rogersville quadrangle: Clapp, F.G. 5
Waynesburg quadrangle: Stone, R.W. 4
glass sand: Stone, R.W. 33
iron: Stevenson, J.J. 3; Stone, R.W. 33
Waynesburg quadrangle: Stone, R.W. 4
limestone: Stevenson, J.J. 3; Stone, R.W. 33
Amity quadrangle: Clapp, F.G. 6
Claysville quadrangle: Munn, M.J. 7
natural gas: Stone, R.W. 1, 8, 33
Amity quadrangle: Clapp, F.G. 4, 6
Claysville quadrangle: Griswold, W.T. 2; Munn, M.J. 7
Masontown quadrangle: Campbell, M.R. 1
Rogersville quadrangle: Clapp, F.G. 5
Waynesburg quadrangle: Stone, R.W. 4
petroleum: Carll, J.F. 4, 9; Stevenson, J.J. 3; Stone, R.W. 1, 8, 33
Amity quadrangle: Clapp, F.G. 4, 6
Claysville quadrangle: Griswold, W.T. 2; Munn, M.J. 7
Masontown quadrangle: Campbell, M.R. 1
Rogersville quadrangle: Clapp, F.G. 5
Waynesburg quadrangle: Stone, R.W. 4
sand: Stevenson, J.J. 3
sandstone: Stone, R.W. 33
Amity quadrangle: Clapp, F.G. 6
Claysville quadrangle: Munn, M.J. 7
shale: Leighton, H. 5; Stone, R.W. 33
Amity quadrangle: Clapp, F.G. 4, 6
Claysville quadrangle: Munn, M.J. 7
stone
Amity quadrangle: Clapp, F.G. 4
high-grade sandstone: Ashley, G.H. 16
Masontown quadrangle: Campbell, M.R. 1
Waynesburg quadrangle: Stone, R.W. 4

Ground water
Greene Co.: Piper, A.M. 1
resources: Stone, R.W. 33
Waynesburg quadrangle: Stone, R.W. 7

Historical geology
Devonian: Clapp, F.G. 3
Devonian-Pennsylvanian
Amity quadrangle: Clapp, F.G. 4
Claysville quadrangle: Munn, M.J. 7
Waynesburg quadrangle: Stone, R.W. 4
Devonian-Permian: Stone, R.W. 8
Amity quadrangle: Clapp, F.G. 6
Devonian-Quaternary, Rogersville quadrangle: Clapp, F.G. 5
Mississippian-Pennsylvanian: Stone, R.W. 1
Pennsylvanian: Stevenson, J.J. 3
Masontown quadrangle: Campbell, M.R. 1
Pennsylvanian-Pleistocene: Stone, R.W. 33

Maps
Economic
Amity quadrangle, mineral resources: Clapp, F.G. 4, 6
Claysville quadrangle, mineral resources: Munn, M.J. 7
coal, bituminous: Stevenson, J.J. 3; Wall, J.S. 1
Masontown quadrangle, mineral resources: Campbell, M.R. 1
petroleum and gas: Stone, R.W. 8
Claysville quadrangle: Griswold, W.T. 2; Munn, M.J. 7
Rogersville quadrangle, mineral resources: Clapp, F.G. 5
Waynesburg quadrangle, mineral resources: Stone, R.W. 4
Geologic: D'Invilliers, E.V. 9; Lesley, J.P. 46, 47; Stevenson, J.J. 3, 5; Stone, R.W. 33
Amity quadrangle: Clapp, F.G. 4
Claysville quadrangle: Munn, M.J. 7
Masontown quadrangle: Campbell, M.R. 1
Rogersville quadrangle: Clapp, F.G. 5
Waynesburg quadrangle: Stone, R.W. 4
Structure, Masontown quadrangle: Campbell, M.R. 1
Structure contour
Amity quadrangle, Pittsburgh coal: Clapp, F.G. 4
Claysville quadrangle
Gordon sand, Devonian: Griswold, W.T. 2; Munn, M.J. 7
Washington limestone, Pennsylvanian: Griswold, W.T. 2; Munn, M.J. 7
Masontown quadrangle, Pottsville sandstone, Pennsylvanian: Campbell, M.R. 1
Pittsburgh coal: Clapp, F.G. 5; Stone, R.W. 8, 33

    - Waynesburg quadrangle, Pittsburgh coal: Stone, R.W. 4
- *Paleontology*
  - ostracodes, Permian: Holland, W.C. 1; Scott, H.W. 1
  - plants, Permian: Darrah, W.C. 4
- *Petrology*
  - peridotite dike: Smith, L.B. 1
- *Physical geology*
  - structure: Sisler, J.D. 11; Stevenson, J.J. 3
  - Washington anticline: Clapp, F.G. 12
- *Physiography*
  - drainage patterns, asymmetrical: Stone, R.W. 25
  - terraces, Pleistocene: Campbell, M.R. 1; Stevenson, J.J. 3

GREENOCKITE
- Lehigh Co.: Lacroix, A. 1

GROSSULARITE, *see* Garnet

GROUND WATER, *see also* Springs, Geysers, Connate water, and Mineral springs
- Allegheny Co.: Hall, T.E. 1; Piper, A.M. 1
  - Pittsburgh area, popular: Adamson, J.H. 4
  - Pittsburgh quadrangle: Johnson, M.E. 9
  - popular: Adamson, J.H. 2
  - valley-fill deposits: Adamson, J.H. 3
- Armstrong Co.: Leggette, R.M. 1
  - Brookville quadrangle: Graeber, C.K. 3
  - Elders Ridge quadrangle: Stone, R.W. 6
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Beaver Co.: Leggette, R.M. 1
  - artesian wells: Clapp, F.G. 10
  - New Castle quadrangle: De Wolf, F.W. 1
- Bedford Co.
  - Ebensburg quadrangle: Butts, C. 4; Clapp, F.G. 2
  - Flintstone quadrangle: Martin, G.C. 2
- Blair Co.
  - Ebensburg quadrangle: Butts, C. 4; Clapp, F.G. 2
  - Tyrone quadrangle: Lohman, S.W. 4
- Bradford Co.: Lohman, S.W. 3
- Bucks Co.: Genth, F.A. 6
  - Trenton quadrangle: Bascom, F. 10
- Butler Co.: Piper, A.M. 1
- Cambria Co.
  - Curwensville-Patton quadrangles: Clapp, F.G. 2
  - Ebensburg quadrangle: Butts, C. 4; Clapp, F.G. 2
- Cameron Co.: Lohman, S.W. 3
- Carbon Co.: Lohman, S.W. 1
- Centre Co., Tyrone quadrangle: Lohman, S.W. 4
- Chester Co.
  - Coatesville-West Chester quadrangles: Bascom, F. 18
  - Elkton quadrangle: Bascom, F. 13
  - well log: Lesley, J.P. 62
- Clarion Co.: Leggette, R.M. 1
  - Brookville quadrangle: Graeber, C.K. 3
- Clearfield Co.
  - Barnesboro-Ebensburg-Patton quadrangles: Clapp, F.G. 2
  - Curwensville quadrangle: Ashley, G.H. 68; Clapp, F.G. 2
- Columbia Co.: Lohman, S.W. 1
- Crawford Co.: Leggette, R.M. 1
- Cumberland Co., Boiling Springs, popular: Stone, R.W. 45
- Dauphin Co.: Lohman, S.W. 1
- Delaware Co.
  - well logs: Carter, O.C.S. 2
  - West Chester quadrangle: Bascom, F. 18
- Elk Co.: Lohman, S.W. 3
- Erie Co.: Leggette, R.M. 1
- Fayette Co.: Hickok, W.O. 10; Piper, A.M. 1
  - Accident-Grantsville quadrangles: Martin, G.S. 1
- Forest Co.: Leggette, R.M. 1
- Franklin Co., Chambersburg-Mercersburg quadrangles: Stose, G.W. 4, 10
- Fulton Co.
  - Hancock quadrangle: Stose, G.W. 5
  - Mercersburg quadrangle: Stose, G.W. 4, 10
- Greene Co.: Piper, A.M. 1; Stone, R.W. 33
  - Waynesburg quadrangle: Stone, R.W. 7
- Huntingdon Co.
  - Tyrone quadrangle: Lohman, S.W. 4
  - warm springs: Stone, R.W. 54
- Indiana Co.: Leggette, R.M. 1
  - Barnesboro quadrangle: Clapp, F.G. 2
  - Elders Ridge quadrangle: Stone, R.W. 6
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Jefferson Co.: Leggette, R.M. 1
  - Brookville quadrangle: Graeber, C.K. 3
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Lackawanna Co.: Lohman, S.W. 1

- Lancaster Co., Coatesville quadrangle: Bascom, F. 18
- Lawrence Co.: Leggette, R.M. 1
  - New Castle quadrangle: De Wolf, F.W. 1
- Lehigh Co.: Miller, B.L. 44
  - southern: Clark, E. 1
- Luzerne Co.: Lohman, S.W. 1
- Lycoming Co.: Lohman, S.W. 3
- McKean Co.: Lohman, S.W. 3
  - geysers: Ashburner, C.A. 5, 10
- Mercer Co.: Leggette, R.M. 1
- Monroe Co.: Lohman, S.W. 1
- Montgomery Co.
  - popular: Foose, R.M. 4
  - well logs: Carter, O.C.S. 2
- Montour Co.: Lohman, S.W. 1
- Northampton Co.: Miller, B.L. 30
- Northcentral: Lohman, S.W. 3
- Northumberland Co.: Lohman, S.W. 1
- Northwestern: Leggette, R.M. 1
- Pennsylvania: Ashley, G.H. 76; Fuller, M.L. 8; Lohman, S.W. 5
  - analyses and bibliography: Collins, W.D. 1; Fuller, M.L. 6
  - deep borings: Darton, N.H. 3
  - popular: Adamson, J.H. 2; Graham, J.B. 2; Stone, R.W. 48
  - resources: Ashley, G.H. 78
  - springs: Anon. 33
  - temperatures: Darton, N.H. 9
- Perry Co., warm springs: Stone, R.W. 54
- Philadelphia Co.: Carter, O.C.S. 5
  - artesian: Darton, N.H. 2
  - popular: Graham, J.B. 1
  - Trenton quadrangle: Bascom, F. 10
  - well logs: Carter, O.C.S. 1
- Pike Co.: Lohman, S.W. 1
- Potter Co.: Lohman, S.W. 3
- Schuylkill Co.: Lohman, S.W. 1
- Somerset Co.
  - Accident-Grantsville quadrangles: Martin, G.C. 1
  - Frostburg quadrangle: Martin, G.C. 2
- Southcentral: Lohman, S.W. 2
- Southeastern: Hall, G.M. 1
  - early drilling: Disbrow, L. 1
  - general: Carter, O.C.S. 4
  - Philadelphia district: Bascom, F. 7
- Southwestern: Piper, A.M. 1
- Sullivan Co.: Lohman, S.W. 3
- Susquehanna Co.: Lohman, S.W. 1
- Tioga Co.: Lohman, S.W. 3
- Venango Co.: Leggette, R.M. 1
- Warren Co.: Leggette, R.M. 1
- Washington Co.: Piper, A.M. 1
  - Pittsburgh quadrangle: Johnson, M.E. 9
- Western
  - generalized: Leggette, R.M. 1
  - oil field water, analyses: Barb, C.F. 2
  - saline: Richardson, G.B. 4
- Westmoreland Co.: Piper, A.M. 1
  - Greensburg quadrangle: Johnson, M.E. 8
  - Pittsburgh quadrangle: Johnson, M.E. 9
- Wyoming Co.: Lohman, S.W. 1

GUIDEBOOKS

- Adams Co.: Foose, R.M. 19; Hickok, W.O. 8; Stone, R.W. 36
- Allegheny Co.: Anon. 29; Fettke, C.R. 9; Grabau, A.W. 2
  - Pittsburgh area: Leighton, H. 8
- Beaver Co.: Fettke, C.R. 9
- Berks Co., Reading area: Willard, B. 48
- Blair Co.: Krynine, P.D. 10; Swartz, F.M. 17
- Cambria Co.: Ashley, G.H. 70; Swartz, F.M. 17
- Carbon Co.: Fraser, D.M. 1
  - anthracite area: Ashley, G.H. 47
- Central: Swartz, F.M. 11
  - Pennsylvania turnpike: Cleaves, A.B. 7, 8
- Centre Co.: Krynine, P.D. 10
- Clinton Co., Lock Haven area: Ulmer, L.J. 1
- Cumberland Co.: Foose, R.M. 19; Hickok, W.O. 8; Stone, R.W. 36
- Dauphin Co.: Ashley, G.H. 54; Hickok, W.O. 6; Meyerhoff, H.A. 7; Stose, G.W. 32; Willard, B. 15, 67
- Dauphin-Northumberland Cos., Dauphin-Sunbury: Willard, B. 46
- Eastern: Cumings, W.L. 2
  - geomorphology: Johnson, D.W. 5
  - mineral deposits: Berkey, C.P. 2
- Fayette Co., Uniontown-Ohiophyle area: Leighton, H. 6
- Franklin Co.: Foose, R.M. 19
- Juniata Co.: Stose, G.W. 32; Willard, B. 15
- Lackawanna Co.: Miller, B.L. 25
- Lancaster Co.: Cloos, E. 8; Meyerhoff, H.A. 7; Sampson, E. 1
- Lebanon Co.: Ashley, G.H. 47; Hickok, W.O. 6; Stose, G.W. 32
- Lehigh Co.: Fraser, D.M. 1; Willard, B. 64
  - Lehigh Valley: Miller, B.L. 31
- Luzerne Co.: Miller, B.L. 25
- Monroe Co.: Fraser, D.M. 1; Willard, B. 40
- Northampton Co.: Fraser, D.M. 1; Willard, B. 64
- Northern: Grow, G.C. 1
- Pennsylvania, railway guide: Macfarlane, J. 3

- Pennsylvania turnpike: Cleaves, A.B. 7, 8
- Perry Co.: Willard, B. 16, 33, 67
- Philadelphia-Pittsburgh: Willard, B. 49
- Philadelphia-Pottsville: Lesley, J.P. 44
- Schuylkill-Berks Cos., Schuylkill River area: Willard, B. 47
- Somerset Co.: Ashley, G.H. 70
- Southcentral, Harrisburg-Newport: Willard, B. 41
- Southeastern: Dryden, A.L. 1
  - Easton-Gettysburg: Johnson, D.W. 1
  - Lower Paleozoic area: Miller, B.L. 23
  - metamorphic rocks: Watson, E.H. 1
  - mineral collecting: Gordon, S.G. 13
  - Philadelphia area: Watson, E.H. 2
- Tioga Co., Bradford area: Fettke, C.R. 17
- Western: Grow, G.C. 1
- Westmoreland Co.: Ashley, G.H. 70; Grabau, A.W. 2
- York Co.: Hickok, W.O. 8; Stose, G.W. 32
  - southern: Jonas, A.I. 11

GUMMITE, *see also* Radioactive minerals
- Delaware Co.: Wherry, E.T. 2

GYPSUM
- Delaware Co.: Rand, T.D. 6
- Luzerne Co.: Northup, M.A. 2
- Northampton Co.: Lewis, H.C. 21

HALITE
- Lehigh Co., Ordovician, Beekmantown, limestone: Miller, B.L. 26

HALLITE, *see* Vermiculite

HALOTRICHITE
- Luzerne Co.: Shrader, J.J. 1
- Philadelphia Co.: Lewis, H.C. 24

HARMOTOME, *see* Zeolites

HARRISBURG AXIS
- Ordovician-Devonian: Willard, B. 57

HEAVY MINERALS, *see also* individual minerals
- Berks Co., Cambrian, Hardyston quartzite: Fraser, D.M. 10
- Bucks Co., rutile-zircon: Genth, F.A. 16
- Central
  - Devonian, Oriskany sandstone: Stow, M.H. 3
  - Ordovician-Silurian: Tuttle, O.F. 1
  - Paleozoic, source: Krynine, P.D. 3
- Chester Co., Wissahickon schist: Copeland, M.J. 1
- Huntingdon Co.
  - Cambro-Ordovician: Grant, A.M. 1
  - Devonian, Oriskany sandstone: Krynine, P.D. 1
- Southeastern
  - key: Dryden, A.L. 3
  - Lower Paleozoic provenance: Dryden, A.L. 2
  - Triassic provenance: Dryden, A.L. 2
  - Wissahickon schist, weathering: Dryden, A.L. 5
- Western, Paleozoic, source: Krynine, P.D. 3

HEMATITE, *see also* Iron
- Montgomery Co.: Schaffer, F.C. 1
- Westmoreland Co.: Hamilton, H.V. 1

HERRENGRUNDITE
- Montgomery Co.: Boucot, A.J. 1

HEULANDITE, *see* Zeolite

HISSINGERITE
- Lancaster Co.: Rand, T.D. 3

HISTORY
- Appalachian structure: Rodgers, J. 1
- Devonian terminology: Willard, B. 36
- early travelers: Myers, R.E. 6
- mineralogy, Philadelphia area: Hamilton, S.H. 2
- Paleozoic ideas, Southeastern: Hunt: T.S. 9
- Pennsylvania Geological Survey: Ashley, G.H. 23, 73; Logue, T.A. 1; Stone, R.W. 42
- Pennsylvania geology to 1876: Lesley, J.P. 26
- petroleum accumulation theories: Billingsley, J.E. 1
- petroleum and gas, Pennsylvania: Carll, J.F. 7
- Pocono Formation, terminology: Ashley, G.H. 57
- Precambrian ideas, Southeastern: Hunt, T.S. 9

HORNBLENDE, *see* Amphibole

HUNTINGDON COUNTY, *see also* Pennsylvania, and Pennsylvania-Central

Areal geology
- Broadtop coal field: Lesley, J.P. 2
- Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Huntingdon quadrangle: White, I.C. 14
- Spruce Creek area: Rogers, R.D. 1
- Tyrone quadrangle: Butts, C. 18
- Warrior Ridge: Barbarosa, A.L. 1

Economic geology
- clay: Leighton, H. 7; Moore, E.S. 2, 3
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- coal, bituminous: Ashburner, C.A. 1; Fluck, F. 1; Sisler, J.D. 27; White, I.C. 14
  - Broadtop basin: Gardner, J.H. 1

  - Huntingdon quadrangle: Butts, C. 20
  - Tyrone quadrangle: Butts, C. 18
- iron: D'Invilliers, E.V. 5; Lesley, J.P. 15, 20, 28; Rutledge, J.J. 1; White, I.C. 14
  - analyses: Genth, F.A. 10
  - Aughwick valley: Ashburner, C.A. 6
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Silurian-Devonian: Dewees, J.H. 1
  - Tyrone quadrangle: Butts, C. 18
- kaolin: Leighton, H. 7
- limestone
  - analyses: Genth, F.A. 10
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Tyrone quadrangle: Butts, C. 18
- manganese, Critchfield mine: Kerns, W.H. 2
- marl: Dickey, F.B.R. 1
- sand, Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- sand and gravel, Tyrone quadrangle: Butts, C. 18
- shale, Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- stone
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Tyrone quadrangle: Butts, C. 18

Ground water

- springs, popular: Stone, R.W. 54
- Tyrone quadrangle: Lohman, S.W. 4

Historical geology

- Cambrian-Ordovician: Grant, A.M. 1
- Cambrian-Mississippian, Tyrone quadrangle: Butts, C. 18
- Cambrian-Pennsylvanian: Butts, C. 13
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Devonian: Willard, B. 61
  - glaciation: Willard, B. 23
- Mississippian: Ashburner, C.A. 1; Reger, D.B. 1
- Ordovician-Pennsylvanian: Ashburner, C.A. 3, 4; White, I.C. 14
  - Aughwick Valley area: Ashburner, C.A. 6
- Paleozoic, Spruce Creek area: Rogers, R.D. 1
- Pennsylvanian: Lesley, J.P. 2
- Pennsylvanian-Permian, Broadtop basin: Gardner, J.H. 1
- Silurian: Ulrich, E.O. 7
- Silurian-Pennsylvanian: Miller, E. 1

Maps

- Economic
  - iron: Platt, F. 16
    - Jackson-Barree Twps.: D'Invilliers, E.V. 10
- Geologic: Lesley, J.P. 46, 50; Platt, F. 16; White, I.C. 14
  - Broadtop basin: Gardner, J.H. 1
  - East Broadtop Railroad area: Dewees, J.H. 1
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - northwestern: D'Invilliers, E.V. 10
  - Orbisonia area: Dewees, J.H. 1; Platt, F. 16
  - Sideling Hill Creek area: Dewees, J.H. 1
  - Three Springs area: Dewees, J.H. 1
  - Tyrone quadrangle: Butts, C. 18
  - western: Platt, F. 15
- Structure, Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Structure contour, Broadtop field, Kelly coal: Gardner, J.H. 1

Mineralogy

- barite: Lewis, H.C. 20
- epsomite: Lewis, H.C. 4

Paleontology

- brachiopods
  - Mississippian, Pocono Formation: Girty, G.H. 3
  - Silurian: Simpson, G.B. 2
- corals, Devonian: Simpson, G.B. 2
- crinoids, Mississippian, Pocono Formation: Girty, G.H. 3
- gastropods. Mississippian, Pocono Formation: Girty, G.H. 3
- mastodon, Quaternary: Robinson, C.W. 1; Will, H.C. 1
- nautiloids, Mississippian, Pocono Formation: Girty, G.H. 3
- ostraeodes, Silurian: Jones, T.R. 1; Ulrich, E.O. 7
- pelecypods
  - Mississippian, Pocono Formation: Girty, G.H. 3
  - Silurian-Devonian: Simpson, G.B. 2
- Pennsylvanian fauna and flora: Gardner, J.H. 1
- trilobites, Devonian: Green, J. 1, 2, 3
- worms, Devonian: Vokes, H.E. 1

Petrology

- heavy minerals
  - Cambro-Ordovician: Grant, A.M. 1
  - Oriskany sandstone: Krynine, P.D. 1

Physical geology

- cave concretions: Stone, R.W. 32
- folding: Claypole, E.W. 14
  - Broadtop area: Roeder, J.H. 1
- structure
  - Broadtop area: Lesley, J.P. 2
  - Nittany Valley: D'Invilliers, E.V. 5

Physiography
cave: Morganroth, L.C. 1
meanders, Raystown Branch of Juniata: Stone, R.W. 40

HYALITE, *see* Opal

HYALOPHANE, *see* Feldspar

HYDRARGILLITE, *see* Gibbsite

HYDROCARBONS, *see also* individual types
Pennsylvania: Genth, F.A. 11

HYDROMAGNESITE
Lancaster Co.: Smith, J.L. 1
(lancasterite), Lancaster Co.: Silliman, B., Jr. 5; Smith, J.L. 1; Weinschenk, E. 1
Northampton Co.: Eyerman, J. 5

HYPERSTHENE, *see* Pyroxene

IGNEOUS ROCKS, *see also* individual types
Adams Co., Blue Ridge area: Bascom, F. 4
albitite
Chester Co.: Larsen, E.S. 1; Gordon, S.G. 3
Lancaster Co.: Gordon, S.G. 3
andesite
Berks Co., Ordovician: Russell, G.C. 1
Southeastern: Bascom, F. 20
anorthosite, Chester Co.: Bascom, F. 20; Smith, I.F. 2
Franklin Co., Blue Ridge area: Bascom, F. 4
latite, Southeastern: Bascom, F. 20
norite
Bucks Co.: Kemp, J.F. 5
Lancaster Co.: Leonard, A.G. 1
Northampton Co.: Ludlum, J.C. 1
phonolite
Chester Co.: Goldsmith, E. 1; Rand, T.D. 24
Montgomery Co.: Goldsmith, E. 1
plumasite, Chester-Delaware Cos.: Gordon, S.G. 3
pyroxenite
Chester Co., serpentine belt: Chester, F.D. 2
Southeastern: Bascom, F. 20
quartz-diabase, Lebanon Co.: Gordon, S.G. 4
quartz-diorite, Southeastern: Bascom, F. 20
quartz-gabbro, Southeastern: Bascom, F. 20
quartz-latite, Southeastern: Bascom, F. 20
quartz-monzonite, Southeastern: Bascom, F. 20
rhyodacite, Southeastern: Bascom, F. 20
Southeastern: Bascom, F. 12, 19, 20
York Co.: Ehrenfield, F. 1

ILLITE
Lehigh-Northampton Cos.: Bates, T.F. 2

ILMENITE
Delaware Co.: Wherry, E.T. 2
(menaccanite), Philadelphia Co.: Ford, J. 1; Knerr, E.B. 2

INDIANA COUNTY, *see also* Pennsylvania and Pennsylvania-Western

Areal geology
Barnesboro quadrangle: Campbell, M.R. 8
Elders Ridge quadrangle: Stone, R.W. 3
Indiana Co.: Anderson, W. 1; Platt, W.G. 1
Indiana quadrangle: Richardson, G.B. 2
Johnstown quadrangle: Phalen, W.C. 3
Latrobe quadrangle: Campbell, M.R. 6
Punxsutawney quadrangle: Ashley, G.H. 33
Smicksburg quadrangle: Shaffner, M.N. 2, 3

Economic geology
cement, Johnstown quadrangle: Phalen, W.C. 3
clay: Leighton, H. 5
Barnesboro quadrangle: Campbell, M.R. 8
Elders Ridge quadrangle: Stone, R.W. 3, 5
Indiana quadrangle: Richardson, G.B. 2
Johnstown quadrangle: Phalen, W.C. 3, 4
Latrobe quadrangle: Campbell, M.R. 6
Punxsutawney quadrangle: Ashley, G.H. 33
Smicksburg quadrangle: Shaffner, M.N. 3
coal, bituminous: Anderson, W. 1; Hall, R.D.N. 1; Peck, F.B. 6; Phalen, W.C. 2; Platt, W.G. 1; Sisler, J.D. 10, 27; Stone, R.W. 2
Barnesboro quadrangle: Campbell, M.R. 8
Elders Ridge quadrangle: Stone, R.W. 3, 5
Indiana quadrangle: Richardson, G.B. 2
Johnstown quadrangle: Phalen, W.C. 3, 4

  - Latrobe quadrangle: Campbell, M.R. 6
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - reserves: Reese, J.F. 8
  - Smicksburg quadrangle: Shaffner, M.N. 3
- flint clay: Ashley, G.H. 4
- iron, Johnstown quadrangle: Phalen, W.C. 3, 4
- limestone
  - Barnesboro quadrangle: Campbell, M.R. 8
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Johnstown quadrangle: Phalen, W.C. 4
  - Latrobe quadrangle: Campbell, M.R. 6
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - Smicksburg quadrangle: Shaffner, M.N. 3
- natural gas
  - Barnesboro quadrangle: Campbell, M.R. 8
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Indiana quadrangle: Richardson, G.B. 2
  - Latrobe quadrangle: Campbell, M.R. 6
  - Punxsutawney quadrangle. Ashley, G.H. 33
  - Smicksburg quadrangle: Shaffner, M.N. 3
- petroleum: Carll, J.F. 9
  - Elders Ridge quadrangle: Stone, R.W. 3
  - Punxsutawney quadrangle: Ashley, G.H. 33
- salt, Latrobe quadrangle: Campbell, M.R. 6
- sand
  - Johnstown quadrangle: Phalen, W.C. 4
  - Latrobe quadrangle: Campbell, M.R. 6
- sandstone
  - Barnesboro quadrangle: Campbell, M.R. 8
  - Elders Ridge quadrangle: Stone, R.W. 3
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - Smicksburg quadrangle: Shaffner, M.N. 3
- shale: Leighton, H. 5
  - Elders Ridge quadrangle: Stone, R.W. 5
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - northeastern: Ashley, G.H. 4
- stone
  - Indiana quadrangle: Richardson, G.B. 2
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - Latrobe quadrangle: Campbell, M.R. 6

Ground water

- Barnesboro quadrangle: Clapp, F.G. 2
- Elders Ridge quadrangle: Stone, R.W. 6
- Indiana Co.: Leggette, R.M. 1
- Smicksburg quadrangle: Shaffner, M.N. 3

Historical geology

- Devonian-Pennsylvanian: Platt, W.G. 1
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Indiana quadrangle: Richardson, G.B. 2
  - Johnstown quadrangle: Phalen, W.C. 3, 4
- Mississippian: Fettke, C.R. 27
- Mississippian-Pennsylvanian: Anderson, W. 1
  - Smicksburg quadrangle: Shaffner, M.N. 2, 3
- Mississippian-Pleistocene, Latrobe quadrangle: Campbell, M.R. 6
- Pennsylvanian
  - Barnesboro quadrangle: Campbell, M.R. 8
  - Punxsutawney quadrangle: Ashley, G.H. 33
- Pennsylvanian channel: Shaffner, M.N. 1

Maps

- Economic
  - Barnesboro quadrangle, mineral resources: Campbell, M.R. 8
  - Elders Ridge quadrangle, mineral resources: Stone, R.W. 3, 5
  - Indiana quadrangle, mineral resources: Richardson, G.B. 2
  - Johnstown quadrangle, mineral resources: Phalen, W.C. 3, 4
  - Latrobe quadrangle, mineral resources: Campbell, M.R. 6
  - Punxsutawney quadrangle, mineral resources: Ashley, G.H. 33
  - Smicksburg quadrangle, mineral resources: Shaffner, M.N. 3
- Geologic: Anderson, W. 1; Lesley, J.P. 46, 47; Platt, W.G. 1
  - Barnesboro quadrangle: Campbell, M.R. 8
  - Elders Ridge quadrangle: Stone, R.W. 3

- Indiana quadrangle: Richardson, G.B. 2
- Johnstown quadrangle: Phalen, W.C. 3
- Latrobe quadrangle: Campbell, M.R. 6
- Punxsutawney quadrangle: Ashley, G.H. 33
- Smicksburg quadrangle: Shaffner, M.N. 2, 3
- Structure, Latrobe quadrangle: Campbell, M.R. 6
- Structure contour
  - Barnesboro quadrangle, Lower Freeport coal: Ashley, G.H. 10; Campbell, M.R. 8
    - Elders Ridge quadrangle, Upper Freeport coal: Stone, R.W. 3, 5
  - Indiana quadrangle, Upper Freeport coal: Richardson, G.B. 2
  - Johnstown quadrangle, Lower Kittanning coal: Phalen, W.C. 3, 4
  - Latrobe quadrangle
    - Pittsburgh coal: Campbell, M.R. 6
    - Pottsville sandstone, Pennsylvanian: Campbell, M.R. 6
  - Punxsutawney quadrangle, Lower Freeport coal: Ashley, G.H. 10
  - Smicksburg quadrangle: Shaffner, M.N. 2
    - Catskill Formation: Shaffner, M.N. 3

Petrology
- peridotite: Graeber, C.K. 1; Honess, A.P. 1, 2

Physical geology
- Indiana anticline: Richardson, G.B. 1
- structure: Hall, R.D.N. 1; Sisler, J.D. 10
  - Barnesboro-Punxsutawney quadrangles: Ashley, G.H. 10

INDUSTRIAL MINERALS, *see also* individual types
- Pennsylvania: Dolbear, S.H. 1; Stone, R.W. 30

INSECTS
- Allegheny Co., Pennsylvanian: Carpenter, F.M. 1
- Beaver Co., Pennsylvanian: Scudder, S.H. 3, 4, 7
- cockroaches, Mercer Co., Pennsylvanian: Cockerell, T.D.A. 1
- Jefferson Co., Pennsylvanian: Carpenter, F.M. 1; Cockerell, T.D.A. 1
- Luzerne Co., Pennsvlvanian: Lacoe, R.D. 2; Scuddder, S.H. 1, 3, 4, 5, 6, 7; Willard, B. 59
- Montgomery Co., Quarternary: Horn, G.H. 1; Wheatley, C.M. 2
- Pennsylvania, Pennsylvanian: Scudder, S.H. 2
- Schuylkill Co., Pennsylvanian: Carpenter, F.M. 1

INSOLUBLE RESIDUES
- Central, Cambro-Ordovician: Sadler, J.W. 1
- Southeastern, Cambro-Ordovician: Hills, J.M. 3

INVERETBRATA, *see also* individual types
- Chester Co., Triassic, Lockatong Formation: Wheatley, C.M. 1

IRON, *see also* iron-bearing minerals
- Adams Co.: Frazer, P. 7, 13, 19, 20; Stose, G.W. 27
  - Fairfield-Gettysburg quadrangles: Stose, G.W. 27
- Allegheny Co.: Stevenson, J.J. 4
  - Freeport quadrangle: Hughes, H.H. 1
- Armstrong Co.
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Shaw, E.W. 4
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
- Beaver Co., Zelienople quadrangle: Richardson, G.B. 12
- Bedford Co.: Lesley, J.P. 13; Stevenson, J.J. 8; Taylor, R.C. 7
  - Hollidaysburg-Huntingdon quadrangles, Butts, C. 20
  - native, arsenic-bearing: Shepard, C.U. 1
  - Sherman Valley: Kerns, W.H. 1
- Berks Co.: D'Invilliers, E.V. 1; Spencer, A.C. 1
- bibliography: Corbin, J.R. 2
- Blair Co.: Platt, F. 15
  - analyses: Genth, F.A. 10
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Tyrone quadrangle: Butts, C. 18
- Bradford Co.: Johnson, W.R. 4; Platt, F. 5; Sherwood, A. 1; Wells, H. 1
- Bucks Co.: Bayley, W.S. 1, 2; McCasky, H.D. 1; Trego, C.B. 2
  - Allentown quadrangle: Miller, B.L. 14
- Butler Co.
  - analyses: McCreath, A.S. 2
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 4
  - Kittanning quadrangle: Butts, C. 3, 6

Cambria Co.: Clemson, T.G. 2; Platt, F. 4
  Johnstown quadrangle: Phalen, W.C. 3, 4
Cameron Co.: Ashburner, C.A. 27
Central: Hopkins, T.C. 7
Centre Co.: D'Invilliers, E.V. 3, 4; Lesley, J.P. 20, 28, 43
  analyses: Genth, F.A. 10, 19
  Bellefonte quadrangle: Butts, C. 16
  Tyrone quadrangle: Butts, C. 18
Chester Co.: Anon. 3; Lesley, J.P. 41
  French Creek area: Smith, L.L. 2
  Honeybrook-Phoenixville quadrangles: Bascom, F. 21
Clarion Co.: Chance, H.M. 6
  Brookville quadrangle: Graeber, C.K. 3
  Clarion-Foxburg quadrangles: Shaw, E.W. 4
  Kittanning quadrangle: Butts, C. 3, 6
  Rural Valley quadrangle: Butts, C. 5, 6
Clearfield Co.: Chance, H.M. 14; Johnson, W.R. 2; Platt, F. 1
Clinton Co.: Chance, H.M. 7
Cumberland Co.: D'Invilliers, E.V. 8; Frazer, P. 20; Harden, J.W. 1; Lesley, J.P. 16
  Boiling Springs area: Burton, S.E. 1
  Fairfield quadrangle: Stose, G.W. 27
  White Rocks area: Foose, R.M. 14
Dauphin Co.: D'Invilliers, E.V. 8; Johnson, W.R. 8
Delaware Co.: Willcox, J. 2
Fayette Co.: Hickok, W.O. 10; Platt, F. 3; Stevenson, J.J. 5
  Accident-Grantsville quadrangles: Martin, G.C. 3
  western: Stevenson, J.J. 4
Franklin Co.: D'Invilliers, E.V. 8; Frazer, P. 20; Harden, J.W. 1; Lesley, J.P. 6
  Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
  Fairfield quadrangle: Stose, G.W. 27
Fulton Co.: Stevenson, J.J. 8
  Silurian-Devonian: Dewees, J.H. 1
Greene Co.: Stevenson, J.J. 3; Stone, R.W. 33
Huntingdon Co.: D'Invilliers, E.V. 5; Lesley, J.P. 15, 20, 28; Rutledge, J.J. 1; White, I.C. 14
  analyses: Genth, F.A. 10
  Aughwick Valley area: Ashburner, C.A. 6
  Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  Silurian-Devonian: Dewees, J.H. 1
  Tyrone quadrangle: Butts, C. 18
Indiana Co., Johnstown quadrangle: Phalen, W.C. 3, 4
Jefferson Co.: Platt, F. 1
  Brookville quadrangle: Graeber, C.K. 3
Juniata Co.: D'Invilliers, E.V. 10
Lancaster Co.: Frazer, P. 29; Genth, F.A. 2; Jonas, A.I. 5, 6; Landis, D.B. 1
  Lancaster quadrangle: Jonas, A.I. 10
  Middletown quadrangle: Stose, G.W. 33
Lawrence Co.: White, I.C. 5
  Zelienople quadrangle: Richardson, G.B. 12
Lebanon Co.: Birkinbine, J. 2; Callaghan, W.H. 1; Cumings, W.L. 1; D'Invilliers, E.V. 7; Fraim, P.B. 1; Hickok, W.O. 1, 7; Hunt, T.S. 6; Lesley, J.P. 53; Spencer, A.C. 1; Staples, J.M. 1; Wilson, E.B. 1; Yaklish, J.P. 1
Lehigh Co.: Miller, B.L. 44; Prime, F. 1, 2, 4, 6
  Allentown quadrangle: Miller, B.L. 14
  Quakertown quadrangle: Bascom, F. 17
Lycoming Co.: Hodge, J.T. 2; Meyer, A. 2; Sherwood, A. 2
McKean Co.: Ashburner, C.A. 14
Mercer Co.: White, I.C. 7
Mifflin Co.: Dewees, J.H. 1; D'Invilliers, E.V. 10
Montgomery Co.: Carter, O.C.S. 1
Montour Co.: Stock, H.H. 1
Northampton Co.: Bayley, W.S. 2; Miller, B.L. 28; Prime, F. 6
  Allentown quadrangle: Miller, B.L. 14
origin: Chance, H.M. 18; Garrison, F.L. 1; Hunt, T.S. 12; Kimball, J.P. 2
Pennsylvania: Ashley, G.H. 76; Birkinbine, J. 1; Corbin, J.R. 2; Daddow, S.H. 1; Hickok, W.O. 2; Hoeffer, H. 1; Hopkins, T.C. 9; Hunt, T.S. 16; Lesley, J.P. 4, 35; Newberry, J.S. 5; Newton, H. 1; Putnam, B.T. 1; Rogers, W.B. 4; Silliman, B., Jr. 9; Smock, J.C. 2
  analyses: McCreath, A.S. 1, 5
  bog iron: Corbin, J.R. 1
  general: Hickok, W.O. 9
Perry Co.: Claypole, E.W. 16
popular: Foose, R.M. 10; Newberry, J.S. 3; Stone, R.W. 51
Potter Co., Gaines quadrangle: Fuller, M.L. 4
Schuylkill Co.: Johnson, W.R. 1
Snyder Co.: D'Invilliers, E.V. 10; Earle, R.B. 1

- Somerset Co.: Johnson, W.R. 9
  - Accident quadrangle: Martin, G.C. 3
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - Southampton Twp.: Johnson, W.R. 12
- Southeastern: Anon. 2; Corbin, J.R. 7; Hopkins, T.C. 7; Newhouse, W.H. 1; Rogers, H.D. 5; Whittlesey, C. 2; Willis, B. 1
  - Cornwall-type deposits: Spencer, A.C. 2
  - popular: Foose, R.M. 15
- Southwestern: Pechin, E.C. 1; Stone, R.W. 14
- Susquehanna Co.: Meredith, T. 1
- Tioga Co.: Platt, F. 5: Sherwood, A. 1; Taylor, R.C. 6
  - analyses: Clemson, T.G. 3
  - Elkland-Tioga quadrangles: Fuller, M.L. 3
  - Gaines quadrangle: Fuller, M.L. 4
- Union Co.: Dewees, J.H. 1; D'Invilliers, E.V. 10; Earle, R.B. 1
- Venango Co., Foxburg quadrangle: Shaw, E.W. 4
- Wayne Co.: Davis, J.P. 1
- Western: Ashley, G.H. 40
- Westmoreland Co.: Platt, F. 3; Stevenson, J.J. 5
  - Freeport quadrangle: Hughes, H.H. 1
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - western: Stevenson, J.J. 4
- York Co.: D'Invilliers, E.V. 8; Frazer, P. 13, 19; Harder, E.C. 1, 3; Neumann, G.L. 1; Stose, G.W. 39
  - Dillsburg area: Frazer, P. 20
  - Hanover-York area: Stose, A.I.J. 1
  - Jauss mine: Spencer, A.C. 3
  - Middletown quadrangle: Stose, G.W. 33
  - origin: Frazer, P. 7, 15

JASPER
- Berks Co., popular: Myers, R.E. 2
- Lehigh Co.
  - Hardyston quartzite: Fraser, D.M. 8
  - mica- and graphite-bearing: Fraser, D.M. 13
  - origin: Myers, P.B. 2
  - popular: Myers, R.E. 2
- Northampton Co., origin: Myers, P.B. 2

JEFFERISITE, *see* Vermiculite

JEFFERSON COUNTY, *see also* Pennsylvania and Pennsylvania-Western
- *Areal geology*
  - Brookville quadrangle: Graeber, C.K. 2, 3
  - Jefferson Co.: Platt, W.G. 3
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - Smicksburg quadrangle: Shaffner, M.N. 2, 3
- *Economic geology*
  - clay
    - Brookville quadrangle: Graeber, C.K. 3
    - Punxsutawney quadrangle: Ashley, G.H. 33
    - Smicksburg quadrangle: Shaffner, M.N. 3
  - coal, bituminous: Peck, F.B. 6; Platt, F. 1; Platt, W.G. 3; Sisler, J.D. 12, 27
    - Brookville quadrangle: Graeber, C.K. 3
    - Homewood coal: Foose, R.M. 5
    - Punxsutawney quadrangle: Ashley, G.H. 33
    - reserves: Sisler, J.D. 23
    - Smicksburg quadrangle: Shaffner, M.N. 3
  - fire clay: Platt, F. 1
  - iron: Platt, F. 1
    - Brookville quadrangle: Graeber, C.K. 3
  - limestone
    - Punxsutawney quadrangle: Ashley, G.H. 33
    - Smicksburg quadrangle: Shaffner, M.N. 3
  - natural gas
    - Brookville quadrangle: Graeber, C.K. 3
    - Punxsutawney quadrangle: Ashley, G.H. 33
    - Smicksburg quadrangle: Shaffner, M.N. 3
  - petroleum: Carll, J.F. 4, 9
    - Punxsutawney quadrangle: Ashley, G.H. 33
  - sandstone
    - Punxsutawney quadrangle: Ashley, G.H. 33
    - Smicksburg quadrangle: Shaffner, M.N. 3
  - shale, Brookville quadrangle: Graeber, C.K. 3
- *Ground water*
  - Brookville quadrangle: Graeber, C.K. 3
  - Jefferson Co.: Leggette, R.M. 1
  - Smicksburg quadrangle: Shaffner, M.N. 3
- *Historical geology*
  - Mississippian-Pennsylvanian: Platt, W.G. 3
    - Brookville quadrangle: Graeber, C.K. 3
    - Smicksburg quadrangle: Shaffner, M.N. 2, 3

  Pennsylvanian: Ashburner, C.A. 28; Ferm, J.C. 1
    Allegheny Formation: Platt, F. 1
    Brookville quadrangle: Graeber, C.K. 2
    Punxsutawney quadrangle: Ashley, G.H. 33
  Pennsylvanian channel: Shaffner, M.N. 1

Maps
  Economic
    Brookville quadrangle, mineral resources: Graeber, C.K. 3
    Punxsutawney quadrangle, mineral resources: Ashley, G.H. 33
    Reynoldsville gas-coal basin: Platt, F. 1
    Smicksburg quadrangle, mineral resources: Shaffner, M.N. 3
  Geologic: Lesley, J.P. 46, 47; Platt, W.G. 3
    Brookville quadrangle: Graeber, C.K. 3
    Punxsutawney quadrangle: Ashley, G.H. 33
    Smicksburg quadrangle: Shaffner, M.N. 2, 3
  Structure contour
    Brookville quadrangle
      Catskill sandstone, Devonian: Graeber, C.K. 3
      Vanport limestone, Pennsylvanian: Graeber, C.K. 2
    Punxsutawney quadrangle, Lower Freeport coal: Ashley, G.H. 10
    Smicksburg quadrangle: Shaffner, M.N. 2
      Catskill Formation, Devonian: Shaffner, M.N. 3

Paleontology
  cockroaches, Pennsylvanian: Cockerell, T.D.A. 1
  insects, Pennsylvanian: Carpenter: F.M. 1

Physical geology
  structure: Platt, W.G. 3; Sisler, J.D. 12
  Punxsutawney quadrangle: Ashley, G.H. 10

JOINTS
  Bedford Co., relation to bedding: Foose, R.M. 12
  Lancaster Co., Chickies Rock: Foose, R.M. 18
  Northern: Parker, J.M. 2

JUNIATA COUNTY, *see also* Pennsylvania, and Pennsylvania-Central

Areal geology
  Juniata Co.: D'Invilliers, E.V. 10

Economic geology
  iron: D'Invilliers, E.V. 10
  phosphate: Ihlseng, M.C. 1; Stone, R.W. 47

Historical geology
  Ordovician-Devonian: D'Invilliers, E.V. 10
  Silurian: Ulrich, E.O. 7

Maps
  Geologic: D'Invilliers, E.V. 10; Lesley, J.P. 46

Paleontology
  crinoid, Silurian: Witmer, J.D. 1
  ostracodes, Silurian: Ulrich, E.O. 7
  worms, Silurian, Clinton group: Howell, B.F. 1, 9

Physical geology
  folding: Claypole, E.W. 14

JURASSIC, *see also* Mesozoic
  Montgomery Co., lignite: Lewis, H.C. 5
  Pennsylvania: Schuchert, C. 3
  Western: Gibson, J.B. 2

KAMES, *see also* Glacial geology
  Lackawanna-Luzerne Cos.: Itter, H.A. 1
  Mercer-Monroe Cos.: Lewis, H.C. 40
  Northampton Co.: Lewis, H.C. 40; Williams, E.H. 3
  Potter Co.: Lewis, H.C. 40
  Tioga Co., Elkland-Tioga quadrangles: Fuller, M.L. 3

KAMMERERITE
  Lancaster Co.: Cooke, J.P. 1; Dieffenbach, O. 1; Genth, F.A. 5; Hermann, R. 3; Pearse, J.B. 1; Smith, J.L. 1; Tschermak, G. 1

KAOLIN, *see also* Clay, and Industrial minerals
  Bedford-Blair Cos.: Leighton, H. 7
  Carbon Co.: Johnson, S.W. 1
  Centre-Cumberland Cos.: Leighton, H. 7
  Chester Co.: Hopkins, T.C. 6
  Delaware Co.: Hopkins, T.C. 6
    Brandywine Summit area: Ashburner, C.A. 33
    origin: Lesley, J.P. 54
  Huntingdon-Lancaster Cos.: Leighton, H. 7
  Monroe-York Cos.: Leighton, H. 7
  Montgomery Co.: Carter, O.C.S. 1

KETTLES, *see also* Glacial geology
  Lackawanna Co., Lackawanna Valley: Branner, J.C. 2
  Luzerne Co., Wyoming Valley: Branner, J.C. 2
  Monroe-Pike Cos.: White, I.C. 11

KEISERITE
  Luzerne Co.: Northup, M.A. 2

KOTSCHUBEITE, *see* Clinochlore

KYANITE
  Chester Co.: Stone, R.W. 47
  Delaware Co.: Stone, R.W. 47; Thomson, T. 1
  Philadelphia Co.: Stone, R.W. 47; Vanuxem, L. 2

LACKAWANNA COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern
  Areal geology
    northern: White, I.C. 12
    Northern anthracite field: Gleason, F.A. 1
  Economic geology
    coal, anthracite: Hill, F.A. 2; Gleason, F.A. 1; Griffith, W. 3; Rogers, H.D. 18; Silliman, B. 4
    sand: Darton, N.H. 4
  Ground water
    Lackawanna Co.: Lohman, S.W. 1
  Historical geology
    Pennsylvanian: Hill, F.A. 2; Gleason, F.A. 1; Sheafer, P.W. 5
      anthracite areas: Miller, B.L. 25
      Northern anthracite field: Ashburner, C.A. 18
    Silurian-Mississippian: White, I.C. 12
  Maps
    Geologic: Lesley, J.P. 46; White, I.C. 10, 12
    Northern anthracite field: Ashburner, C.A. 18
  Mineralogy
    dopplerite: Cooper, T. 1; Lewis, H.C. 26
    phytocolite: Cooper, T. 1; Lewis, H.C. 26
  Paleontology
    fish, Devonian, Catskill Formation: Cope, E.D. 12
    plants, Pennsylvanian: Davis, R.N. 1; Eaton, A. 4; Teschermacher, J.E. 2
  Petrology
    coal, anthracite, grooved: Lewis, S. 1
  Physical geology
    earthquakes: Bodle, R.R. 1
    Lackawanna basin, origin: Willard, B. 63
    potholes
      Archbald area: Ashburner, C.A. 31
      Pleistocene: Dana, J.D. 3
      Scranton area: Davis, R.N. 2; Eaton, H.N. 2
    structure
      anthracite basins: Lyman, B.S. 8
      Northern anthracite basin: Darton, N.H. 11
  Physiography
    buried valleys: Itter, H.A. 1
      Newport Creek: Ashburner, C.A. 31
      Wyoming Valley: Kemp, J.F. 8
    drainage changes: Itter, H.A. 1
    glacial geology: Branner, J.C. 4; Itter, H.A. 1; White, I.C. 12
      Lackawanna Valley: Branner, J.C. 2
    kames: Itter, H.A. 1
    peneplains: Itter, H.A. 1
    Pittston-Nanticoke glacial lake: Itter, H.A. 1
    striae: Branner, J.C. 5
    terraces: Itter, H.A. 1

LAKES, *see also* Glacial lakes
  Mifflin Co., Kishacoquilla Valley: Taylor, R.C. 4
  Northeastern, glacial origin: Davis, W.M. 1

LANCASTER COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Southeastern
  Areal geology
    Coatesville quadrangle: Bascom, F. 18
    Honeybrook quadrangle: Bascom, F. 21
    Lancaster Co.: Frazer, P. 29; Mombert, J.I. 1
    Lancaster quadrangle: Jonas, A.I. 10
    McCalls Ferry quadrangle: Jonas, A.I. 5; Knopf, E.F.B. 4
    Martic overthrust area: Cloos, E. 8
    Middletown quadrangle: Stose, G.W. 33
    New Holland quadrangle: Jonas, A.I. 7
    Piedmont district: Bascom, F. 8
    Quarryville quadrangle: Jonas, A.I. 6; Knopf, E.F.B. 4
    South Mtn. area: Eaton, H.N. 1
    southern: Cloos, E. 3
  Economic geology
    clay: Ries, H. 5
      Honeybrook quadrangle: Bascom, F. 21
      New Holland quadrangle: Jonas, A.I. 7
    chromium: Corbin, J.R. 4; Diller, J.S. 1; Foose, R.M. 10; Frazer, P. 29; Glenn, W. 1; Gordon, S.G. 6; Knopf, E.F.B. 1, 4; McIntosh, F.K. 1; Phalen, W.C. 5; Sampson, E. 1
      Quarryville quadrangle: Jonas, A.I. 6
    copper: Frazer, P. 29
    feldspar, Honeybrook quadrangle: Bascom, F. 21

flint, Honeybrook quadrangle: Bascom, F. 21
gold: Genth, F.A. 4
  Gap nickel mine: Corbin, J.R. 6
iron: Genth, F.A. 2; Frazer, P. 29; Jonas, A.I. 5; Landis, D.B. 1
  Grubb ore banks: Knopf, E.F.B. 4
  Middletown quadrangle: Stose, G.W. 33
  Quarryville quadrangle: Jonas, A.I. 6
kaolin: Leighton, H. 7
lead: Landis, D.B. 1; Miller, B.L. 10, 13
lignite: Rogers, W.B. 3
limestone: Herr, L.B. 1; Jonas, A.I. 5
  Middletown quadrangle: Stose, G.W. 33
  New Holland quadrangle: Jonas, A.I. 7
  Quarryville quadrangle: Jonas, A.I. 6
magnesite: Frazer, P. 29; Stone, R.W. 17, 47
mineral resources, popular: Foose, R.M. 6
nickel: Frazer, P. 29; Kemp, J.F. 6; Knopf, E.F.B. 4; Moyd, L.S. 1; Phemister, T.C. 1; Sampson, E. 1
  popular: Foose, R.M. 10
  Quarryville quadrangle: Jonas, A.I. 6
paint ore: Landis, D.B. 1
platinum: Genth, F.A. 4
roofing granules: Stone, R.W. 20
sand: Landis, D.B. 1
  Honeybrook quadrangle: Bascom, F. 21
  Middletown quadrangle: Stose, G.W. 33
  New Holland quadrangle: Jonas, A.I. 7
  Quarryville quadrangle: Jonas, A.I. 6
serpentine: Frazer, P. 29; Prouty, W.F. 1
shale, New Holland quadrangle: Jonas, A.I. 7
silver: Foose, R.M. 17; Genth, F.A. 4
  McCalls Ferry quadrangle: Jonas, A.I. 5
McCalls Ferry-Quarryville district: Knopf, E.F.B. 4
slate: Behre, C.H. 9; Dale, T.N. 2; Frazer, P. 29; Merriman, M. 1; Sampson, E. 1
  Peach Bottom area: Knopf, E.F.B. 4
  Quarryville quadrangle: Jonas, A.I. 6
stone
  Coatesville quadrangle: Bascom, F. 18
  Honeybrook quadrangle: Bascom, F. 21
titanium: Genth, F.A. 4
zinc: Landis, D.B. 1; Miller, B.L. 13; Mosier, M. 1

Ground water
  Coatesville quadrangle: Bascom, F. 18

Historical geology
  Cambrian: Resser, C.E. 3; Roddy, H.J. 1; Walcott, C.D. 5
  Cambrian-Ordovician: Abbey, M.B. 1; Frazer, P. 23; Stose, G.W. 18
  Cambrian-Pleistocene, Lancaster quadrangle: Jonas, A.I. 10
  Ordovician
    Conestoga limestone: Jonas, A.I. 14
    Peach Bottom slate: Frazer, P. 28, 35; Lesley, J.P. 36
  Precambrian-Ordovician: Cloos, E. 3; Platt, F. 16
    McCalls Ferry quadrangle: Jonas, A.I. 5; Knopf, E.F.B. 4
    Quarryville quadrangle: Jonas, A.I. 6; Knopf, E.F.B. 4
  Precambrian-Tertiary: Frazer, P. 29
    Coatesville quadrangle: Bascom, F. 18
    Middletown quadrangle: Stose, G.W. 33
  Precambrian-Triassic
    Coatesville quadrangle: Bascom, F. 18
    Honeybrook quadrangle: Bascom, F. 21
    New Holland quadrangle: Jonas, A.I. 7
    South Mtn. area: Eaton, H.N. 1
  Silurian, Peach Bottom slate: Stose, G.W. 45
  Tertiary gravel: Stose, G.W. 26
  Triassic: Frazer, P. 25
    lignite: Rogers, W.B. 3

Maps
  Economic
    iron, West Hempfield Twp.: Frazer, P. 29
    Lancaster quadrangle, mineral resources: Jonas, A.I. 10
  Geologic: Frazer, P. 29; Lesley, J.P. 46, 47
    Coatesville quadrangle: Bascom, F. 18
    Honeybrook quadrangle: Bascom, F. 21
    Honeybrook uplift: Stose, G.W. 37
    Lancaster quadrangle: Jonas, A.I. 10
    McCalls Ferry-Quarryville district: Knopf, E.F.B. 4
    Middletown quadrangle: Stose, G.W. 33

  - New Holland quadrangle: Jonas, A.I. 7
  - Peach Bottom slate area: Behre, C.H. 9
  - Quarryville quadrangle: Jonas, A.I. 6
  - South Mtn. area: Eaton, H.N. 1
  - southern: Cloos, E. 3
- Structure, Coatesville quadrangle: Bascom, F. 18

Mineralogy
- albite: Silliman, B., Jr. 3
- allite: Silliman, B., Jr. 4
- anthophyllite: Genth, F.A. 14
- bronzite: Genth, F.A. 5
- brueite: Hermann, R. 4; Hessenberg, F. 1, 2; Rose, G. 1; Smith, J.L. 1
- buratite: Taylor, W.J. 1
- cacoxenite: Goldsmith, E. 1
- chromite: Dieffenbach, O. 1
- clinochlore: Cooke, J.P. 1; Koksharov, N. von 1; Tschermak, G. 1
- cordierite, idiomorphic: Tomlinson, W.H. 4
- dolomite: Genth, F.A. 5
- feldspar: Hopkins, T.C. 5
- genthite: Genth, F.A. 3
- heulandite: Knerr, E.B. 1
- hisingerite: Rand, T.D. 3
- hydromagnesite: Smith, J.L. 1
  - (lancasterite): Silliman, B., Jr. 5; Smith, J.L. 1; Weinschenk, E. 1
- ilmenite (menaccanite): Knerr, E.B. 2
- kammererite: Cooke, J.P. 1; Dieffenbach, O. 1; Genth, F.A. 5; Hermann, R. 3; Pearse, J.B. 1; Smith, J.L. 1; Tschermak, G. 1
- kotschubeite: Tschermak, G. 1
- lansfordite: Hermann, R. 1
- limonite, pyrite pseudomorphs: Willig, H.L. 1
- millerite: Blake, W.P. 2
- mineral localities: Beck, H.H. 1
- New Texas area, minerals: Gordon, S.G. 5
- perrine: Pirsson, L.V. 1
- pyrite, magnetic: Boyé, M.H. 1
- quartz: Taber, T. 1
- rhodochrome: Dieffenbach, O. 1; Smith, J.L. 1
- rhodophyllite: Genth, F.A. 5; Smith, J.L. 1
- smithsonite: Taylor, W.J. 2
- tennantite: Taylor, W.J. 1
- uvarovite: Shepard, C.U. 3
- vauquelinite: Taylor, W.J. 3
- williamsite: Shepard, C.U. 2; Silliman, B., Jr. 2
- zaratite: Silliman, B., Jr. 1; Slavik, F. 1; Smith, J.L. 1

Paleontology
- algae, Ordovician, Peach Bottom slate: Frazer, P. 35
- brachiopods, Cambrian: Walcott, C.D. 9
- Cambrian fauna: Resser, C.E. 3
- coelenterate, Cambrian: Ruedemann, R. 1
- plants, Cambrian: Haldeman, S.S. 1
- trilobites, Cambrian, Kinzers shale: Dunbar, C.O. 1
- worm: Ruedemann, R. 3

Petrology
- albitite: Gordon, S.G. 3
- amphibolite, Gap mine: Phemister, T.C. 1
- basalt glass: Tomlinson, W.H. 3
- concretions, algal, origin: Price, J.W. 1; Roddy, H.J. 2, 4
- diabase: Frazer, P. 25, 27; Smith, T.P. 1; Tomlinson, W.H. 6
  - schist assimilation: Tomlinson, W.H. 7
- gabbro: Leonard, A.G. 1
- intraformational conglomerate: Walcott, C.D. 7
- norite: Leonard, A.G. 1
- schist, albite trends: Ingerson, F.E. 1
- serpentine: Leonard, A.G. 1
- steatite: Rand, T.D. 22

Physical geology
- "deeps," Susquehanna River: Daly, R.A. 1; Mathews, E.B. 2
- earthquake: Anon. 1; Bodle, R.R. 1
- faulted folds: Stose, G.W. 20
- faults, southern: Cloos, E. 3
- "Martic" anticline: Frazer, P. 24
- Martic overthrust: Cloos, E. 8
- recumbent folding: Jonas, A.I. 15
- structure
  - Chickies Rock: Foose, R.M. 18; Frazer, P. 26
  - Honeybrook uplift: Stose, G.W. 37
  - Peach Bottom slate: Agron, S.L. 1; Biemsderfer, G.K. 1
  - South Mtn. area: Eaton, H.N. 1

Physiography
- Lancaster Co.: Roddy, H.J. 3
- Susquehanna River deeps: Daly, R.A. 1; Mathews, E.B. 2
- Susquehanna River potholes: Beck, H.H 2, 3
- terraces
  - high-level: Lesley, J.P. 33
  - Susquehanna River: Mackin, J.H. 1; Meyerhoff, H.A. 7; Stose, G.W. 26; Wright, G.F. 8

LANCASTERITE, *see* Hydromagnesite

LANSFORDITE
Lancaster Co.: Hermann, R. 1
Schuylkill Co.: Genth, F.A. 23

LANTHANITE
Lehigh Co.: Blake, W.P. 3; Genth, F.A. 8; Lindstrom, C. 1; Smith, J.L. 1

LAUMONTITE, *see* Zeolites

LAWRENCE COUNTY, *see also* Pennsylvania, and Pennsylvania-Western
Areal geology
Lawrence Co.: White, I.C. 5
New Castle quadrangle: De Wolf, F.W. 1
Zelienople quadrangle: Richardson, G.B. 12
Economic geology
cement: Peck, F.B. 10
New Castle quadrangle: De Wolf, F.W. 1
clay: Leighton, H. 5
New Castle quadrangle: De Wolf, F.W. 1
Zelienople quadrangle: Richardson, G.B. 12
coal, bituminous: Chance, H.M. 3; Sisler, J.D. 13, 27; White, I.C. 5
New Castle quadrangle: De Wolf, F.W. 1
Zelienople quadrangle: Richardson, G.B. 12
iron: White, I.C. 5
Zelienople quadrangle: Richardson, G.B. 12
limestone
New Castle quadrangle: De Wolf, F.W. 1
Zelienople quadrangle: Richardson, G.B. 12
marl: Dickey, F.B.R. 1
natural gas
New Castle quadrangle: De Wolf, F.W. 1
Zelienople quadrangle: Richardson, G.B. 12
petroleum: Carll, J.F. 2; Clark, H.R. 1
New Castle quadrangle: De Wolf, F.W. 1
Zelienople quadrangle: Richardson, G.B. 12
sand, Zelienople quadrangle: Richardson, G.B. 12
sand and gravel, New Castle quadrangle: De Wolf, F.W. 1
sandstone
New Castle quadrangle: De Wolf, F.W. 1
Zelienople quadrangle: Richardson, G.B. 12
shale: Leighton, H. 5
New Castle quadrangle: De Wolf, F.W. 1
Zelienople quadrangle: Richardson, G.B. 12
stone, New Castle quadrangle: De Wolf, F.W. 1
Ground water
Lawrence Co.: Leggette, R.M. 1
New Castle quadrangle: De Wolf, F.W. 1
Historical geology
Devonian-Mississippian: Chance, H.M. 5
Mississippian-Pennsylvanian: Lesley, J.P. 22
Pennsylvanian: Chance, H.M. 3; White, I.C. 5
New Castle area: Leasure, D. 1
Pennsylvanian-Pleistocene
New Castle quadrangle: De Wolf, F.W. 1
Zelienople quadrangle: Richardson, G.B. 12
Maps
Economic
New Castle quadrangle, mineral resources: De Wolf, F.W. 1
petroleum and gas, New Castle quadrangle: De Wolf, F.W. 1
Zelienople quadrangle, mineral resources: Richardson, G.B. 12
Geologic: Lesley, J.P. 46, 47; White, I.C. 5
New Castle quadrangle: De Wolf, F.W. 1
surficial deposits: De Wolf, F.W. 1
Zelienople quadrangle: Richardson, G.B. 12
Structure contour
New Castle quadrangle, Middle Kittanning coal: De Wolf, F.W. 1
Zelienople quadrangle, Vanport limestone, Pennsylvanian: Richardson, G.B. 12
Paleontology
plants, Pennsylvanian: Lesquereux, L. 9
Physiography
drainage changes, Big Beaver River: White, I.C. 5
glacial drift: White, I.C. 5
New Castle quadrangle: De Wolf, F.W. 1
terraces, Beaver River: White, I.C. 5

LEAD, *see also* lead-bearing minerals
Blair Co.: Platt, F. 15
Huntingdon quadrangle: Butts, C. 18
popular: Stone, R.W. 51

Sinking Valley area: Miller, B.L. 8; Myers, W.M. 2; Reed, D.F. 1
Tyrone quadrangle: Butts, C. 18
Bucks Co.: Annear, J. 1
New Galena area: Miller, B.L. 9
popular: Stone, R.W. 51
Triassic: Lyman, B.S. 7
Centre Co.
Bellefonte area: Myers, W.M. 2
Bellefonte quadrangle: Butts, C. 16
Tyrone quadrangle: Butts, C. 18
Chester Co.: Anon. 3; Bascom, F. 9; Blake, W.P. 5; Lesley, J.P. 41; Rogers, H.D. 16; Woodhouse, J. 2
Phoenixville area: Miller, B.L. 11
Phoenixville quadrangle: Bascom, F. 21
Pickering Creek area: Reed, D.F. 2
popular: Stone, R.W. 51
Fayette Co.: Stevenson, J.J. 5
Lancaster Co.: Landis, D.B. 1; Miller, B.L. 10
Lancaster quadrangle: Jonas, A.I. 10
Montgomery Co.
Philadelphia district: Bascom, F. 9
Phoenixville area: Miller, B.L. 11
popular: Stone, R.W. 51
Triassic: Lyman, B.S. 7
Northumberland Co.: Johnson, J.W. 1
Pennsylvania: Ashley, G.H. 76; Miller, B.L. 13
analyses: McCreath, A.S. 3
Southeastern: Anon. 2; Talmage, S.B. 1
Wyoming Co.: White, I.C. 12

LEBANON COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Southeastern

Areal geology
Lancaster quadrangle: Jonas, A.I. 10
Middletown quadrangle: Stose, G.W. 33
South Mtn. area: Eaton, H.N. 1

Economic geology
brownstone, Hummelstown area: D'Invilliers, E.V. 8
cobalt, Cornwall area: Lesley, J.P. 53
copper, Cornwall area: Lesley, J.P. 53
gold, Cornwall iron mines: Corbin, J.R. 6
iron: Birkinbine, J. 2; Cumings, W.L. 1; D'Invilliers, E.V. 7; Frain, P.B. 1; Hickok, W.O. 1, 7; Hunt, T.S. 6; Lesley, J.P. 53; Spencer, A.C. 1, 2; Staples, J.M. 1; Wilson, E.B. 1; Yaklish, J.P. 1
limestone: D'Invilliers, E.V. 8
slate: Behre, C.H. 9

Historical geology
Ordovician-Tertiary, Middletown quadrangle: Stose, G.W. 33
Precambrian-Triassic
Lancaster quadrangle: Jonas, A.I. 10
South Mtn. area: Eaton, H.N. 1
Triassic: Stose, G.W. 22
basalt: Stose, G.W. 23

Maps
Economic, limestone: D'Invilliers, E.V. 8; Swain, F.M. 2
Geologic: Lesley, J.P. 46
Cornwall area: Spencer, A.C. 2
Lancaster quadrangle: Jonas, A.I. 10
Middletown quadrangle: Stose, G.W. 33
Reading Prong: Stose, G.W. 36
South Mtn. area: Eaton, H.N. 1
Southern anthracite field: Ashburner, C.A. 18

Mineralogy
analcite: Eyerman, J. 1
andradite: Eyerman, J. 1
chalcopyrite: Ulke, T. 1
Cornwall area: Seybert, H. 1
chloropal: Eyerman, J. 1
chrysotile: Eyerman, J. 1
galena: Brush, G.J. 1; Torrey, J. 1
lepidolite: Eyerman, J. 1
magnetite: Ulke, T. 1
neolite: Eyerman, J. 1
prehnite: Genth, F.A. 17
pyrite: Hawkins, A.C. 3; Travis, C. 1; Ulke, T. 1
ripidolite: Eyerman, J. 1
sphalerite: Genth, F.A. 17

Paleontology
coral reef, Devonian: Willard, B. 30

Petrology
basalt
Ordovician: Gordon, S.G. 4; Stose, G.W. 24
Triassic: Stose, G.W. 23
quartz-diabase: Gordon, S.G. 4

Physical geology
Reading overthrust: Stose, G.W. 36
structure
South Mtn. area: Eaton, H.N. 1
Southern anthracite field: Ashburner, C.A. 18

LEHIGH COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Southeastern
bibliography: Miller, B.L. 42
gravity investigation: Hersey, J.B. 2

Areal geology
Allentown quadrangle: Miller, B.L. 14
Lehigh Co.: D'Invilliers, E.V. 2; Lesley, J.P. 42; Miller, B.L. 5, 44
Lehigh gap: Lotham, E.B. 1
Lower Milford Twp.: Brown, C.W. 1
Quakertown quadrangle: Bascom, F. 17

Economic geology

- cement: Eckel, E.C. 1, 4; Miller, B.L. 19, 44; Peck, F.B. 7, 8
  - Allentown quadrangle: Miller, B.L. 14
- clay: Miller, B.L. 44
  - Allentown quadrangle: Miller, B.L. 14
- coal, anthracite, westward bituminization: Lea, M.C. 1
- copper, Allentown quadrangle: Miller, B.L. 14
- graphite: Miller, B.L. 3, 4, 44
  - Allentown quadrangle: Miller, B.L. 14
- iron: Callaghan, W.H. 1; Getz, A.J. 1; Miller, B.L. 44; Prime, F. 1, 2, 4, 6
  - Allentown quadrangle: Miller, B.L. 14
  - Quakertown quadrangle: Bascom, F. 17
- lead, Friedensville area: Miller, B.L. 13
- limestone: Buck, L.J. 1; Miller, B.L. 44
  - Allentown quadrangle: Miller, B.L. 14
  - Quakertown quadrangle: Bascom, F. 17
- manganese: Miller, B.L. 7, 44
  - Allentown quadrangle: Miller, B.L. 14
- mica, Allentown quadrangle: Miller, B.L. 14
- paint ore: Miller, B.L. 44; Stoddard, J.C. 1
  - Allentown quadrangle: Miller, B.L. 14
  - Quakertown quadrangle: Bascom, F. 17
- peat, Allentown quadrangle: Miller, B.L. 14
- sand and gravel: Miller, B.L. 44
  - Allentown quadrangle: Miller, B.L. 14
- slate: Behre, C.H. 8, 9; Chance, H.M. 13; Dale, T.N. 1, 2; Merriman, M. 1; Miller, B.L. 46; Sanders, R.H. 2; Silliman, B., Jr. 8
  - Allentown quadrangle: Miller, B.L. 14
- stone; Miller, B.L. 44
  - Allentown quadrangle: Miller, B.L. 14
- zinc: Clerc, F.L. 1; DeLury, J.S. 1; Drinker, H.S. 1; Fraser, D.M. 3; Miller, B.L. 12, 13, 44; White, C.B. 1
  - Allentown quadrangle: Miller, B.L. 14
  - plant indicators: Robinson, W.O. 1
  - popular: Blank, E.W. 1

Ground water

- Lehigh Co.: Miller, B.L. 44
- southern limestone area: Clark, E. 1

Historical geology

- Cambrian: Peck, F.B. 3
  - Hardyston Formation: Miller, B.L. 43; Myers, P.B. 1; Prime, F. 7
  - Hardyston-Tomstown contact: Whitcomb, L. 9
- Cambrian-Ordovician: Peck, F.B. 8; Prime, F. 2, 6
- Ordovician
  - andesite, metamorphosed: Fraser, D.M. 7
  - Beekmantown limestone: Miller, B.L. 26
  - Jacksonburg limestone: Miller, R.L. 2, 5
  - Martinsburg Formation: Willard, B. 56
  - rhythms in slate and limestone: Barrell, J. 7
- Ordovician-Silurian: Miller, B.L. 31
- Pleistocene: Williams, E.H. 4
- Precambrian
  - Byram granite gneiss: Fraser, D.M. 16
  - Franklin Formation: Fraser, D.M. 16
  - metadiabase: Fraser, D.M. 16
  - Moravian Heights Formation: Fraser, D.M. 16
  - pegmatite: Fraser, D.M. 16
  - Pochuck gneiss: Fraser, D.M. 16
- Precambrian-Paleozoic: Prime, F. 4
- Precambrian-Pleistocene: Lesley, J.P. 42; Miller, B.L. 47
  - Allentown quadrangle: Miller, B.L. 14
- Precambrian-Triassic: Brown, C.W. 1
  - Quakertown quadrangle: Bascom, F. 17
- Silurian, Lehigh Gap: Ashley, G.H. 32
- Triassic: Wherry, E.T. 30

Maps

- Economic
  - Allentown quadrangle, mineral resources: Miller, B.L. 14
  - cement: Miller, B.L. 19; Peck, F.B. 7
  - iron: Prime, F. 2, 4
    - Allentown quadrangle: Miller, B.L. 14
  - Lehigh Co., mineral resources: Miller, B.L. 44
- Geologic: Lesley, J.P. 42, 46, 47; Miller, B.L. 44; Peck, F.B. 8; Prime, F. 4
  - Allentown quadrangle: Miller, B.L. 14
  - cement district: Eckel, E.C. 2, 4
  - Quakertown quadrangle: Bascom, F. 17

Reading Prong: Lesley, J.P. 42, 48; Stose, G.W. 36
slate belt: Behre, C.H. 9
Slatedale-Slatington area: Behre, C.H. 9

Mineralogy
allanite: Blake, W.P. 4
allophane: Smith, E.F. 2
aragonite: Faux, F.R. 1
calcite: Thomas, C.A. 6
chloropal: Smith, E.F. 2
chrysocolla: Smith, S. 1
corundum: Pennypacker, C.H. 2; Smith, E.F. 1, 2
fluorite: Smith, E.F. 2
Friedensville mines: Thomas, C.A. 10
garnet: Smith, E.F. 2
goslarite: Rand, T.D. 2
greenockite: Lacroix, A. 1
halite: Miller, B.L. 26
illite: Bates, T.F. 2
jasper: Myers, P.B. 2; Myers, R.E. 2
lanthanite: Blake, W.P. 3; Genth, F.A. 8; Lindstrom, G. 1; Smith, J.L. 1
mineral localities and analyses: Miller, B.L. 44
pectolite: Smith, E.F. 3
pyrite, Allentown quadrangle: Miller, B.L. 14
pyrolusite: Smith, E.F. 2
sauconite: Ross, C.S. 3
sericite, Reading Prong, origin: Fraser, D.M. 5
smithsonite: Smith, S. 1
sphalerite: Fraser, D.M. 3
mylonitized: Butler, R.D. 1
stilbite: Smith, E.F. 2
titanite: Smith, E.F. 3
tourmaline: Smith, E.F. 2
wavellite: Gordon, S.G. 8; Smith, E.F. 1, 2
zircon: Smith, E.F. 2

Paleontology
crustacean, Ordovician: Ruedemann, R. 4
reptiles, Triassic: Colbert, E.H. 1; Lea, I. 6, 7
worms, Cambrian: Miller, B.L. 38

Petrology
Byram granite gneiss, Precambrian: Fraser, D.M. 16
diabase
Ordovician: Fraser, D.M. 7
Precambrian: Jonas, A.I. 3
Triassic: Jonas, A.I. 3
diorite, assimilation: Fraser, D.M. 2
dolomite, Allentown quadrangle: Salisbury, S.H. 1
flood deposit, Lehigh River: Gault, H.R. 1
Franklin Formation, Precambrian: Fraser, D.M. 16
Hardyston quartzite, Cambrian
"desert varnish": Miller, B.L. 37
Limeport area, jasperized: Fraser, D.M. 8
jasper: Myers, P.B. 2
mica- and graphite-bearing: Fraser, D.M. 13
metadiabase, Precambrian: Fraser, D.M. 16
metamorphic rocks: Hall, C.E. 8
Moravian Heights Formation, Precambrian: Fraser, D.M. 16
pegmatite, Precambrian: Fraser, D.M. 16
Pochuck gneiss, Precambrian: Fraser, D.M. 16
slate, structural petrography: Behre, C.H. 7

Physical geology
folding, Taconic: Behre, C.H. 2
Reading overthrust: Miller, B.L. 51; Stose, G.W. 36, 41
shearing, Reading Prong: Fraser, D.M. 6
structure: D'Invilliers, E.V. 2
Lehigh gap: Chance, H.M. 13

Physiography
Bake Oven Knob: Berlin, A.F. 1
caves: Faux, F.R. 1; Miller, B.L. 27, 45
drainage changes, Lehigh River: Lesley, J.P. 42
drumlins: Williams, E.H. 13
erosion surfaces: Miller, B.L. 45
glacial geology: Miller, B.L. 44; Williams, E.H. 1, 4
Reading Prong: Williams, E.H. 2
Lake Packer, Pleistocene: Williams, E.H. 3, 13
Lieberts gap, origin: Myers, R.E. 3, 7
water and wind gaps: Miller, B.L. 45

LEIDYITE
Delaware Co.: Koenig, G.A. 1, 3

LENNILITE, *see* Orthoclase

LEPIDOLITE, *see* Mica

LEPIDOCROCITE
Northampton Co.: Posnjak, E. 1

LESLEYITE, *see* Margarite

LIGNITE
Franklin Co.: Lesley, J.P. 6
Lancaster Co., Triassic: Rogers, W.B. 3
Montgomery Co.: Carter, O.C.S. 1
Oligocene: Lewis, H.C. 13
Tertiary or Jurassic: Lewis, H.C. 5

LIMESTONE
- Adams Co.: Stose, G.W. 21
  - analyses: Fraser, P. 10
- Allegheny Co.
  - Beaver quadrangle: Woolsey, L.H. 3, 4
  - Brownsville quadrangle: Campbell, M.R. 2
  - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
  - Freeport quadrangle: Hughes, H.H. 1
  - Pittsburgh quadrangle: Johnson, M.E. 9
  - Sewickley quadrangle: Munn, M.J. 5
- Armstrong Co.: Platt, W.G. 2
  - Clarion quadrangle: Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Beaver Co.: Mansfield, I.F. 3
  - Beaver quadrangle: Woolsey, L.H. 3, 4
  - Burgettstown quadrangle: Shaw, E.W. 3
  - New Castle quadrangle: De Wolf, F.W. 1
  - Sewickley quadrangle: Munn, M.J. 5
  - Zelienople quadrangle: Richardson, G.B. 12
- Bedford Co.: Stevenson, J.J. 8
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Pawpaw quadrangle: Stose, G.W. 12
- Berks Co.: D'Invilliers, E.V. 8
  - Annville area, weathering: Miller, B.L. 16
- Blair Co.
  - analyses: Genth, F.A. 10
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg quadrangle: Butts, C. 20
  - Patton quadrangle: Campbell, M.R. 8
  - Tyrone quadrangle: Butts, C. 18
- Bradford Co.: Johnson, W.R. 4; Wells, H. 1
- Bucks Co.
  - Allentown quadrangle: Miller, B.L. 14
  - Doylestown quadrangle: Bascom, F. 17
- Butler Co.: Fettke, C.R. 6
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 4
  - Kittanning quadrangle: Butts, C. 3, 6
  - Sewickley quadrangle: Munn, M.J. 5
- Cambria Co.
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Ebensburg quadrangle: Butts, C. 4
  - Johnstown quadrangle: Phalen, W.C. 4
- Centre Co.: Kay, G.M. 4
  - analyses: Genth, F.A. 10, 19
  - Bellefonte quadrangle: Butts, C. 16
  - solubility rates: Ewing, A.L. 2
  - Tyrone quadrangle: Butts, C. 18
- Chester Co.: Lesley, J.P. 41
- Clarion Co.
  - Clarion-Foxburg quadrangles: Shaw, E.W. 4
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
- Clearfield Co.: Chance, H.M. 14; Johnson, W.R. 2
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Curwensville quadrangle: Ashley, G.H. 68
  - Punxsutawney quadrangle: Ashley, G.H. 33
- Clinton Co.: Kay, G.M. 4
- Cumberland Co.: D'Invilliers, E.V. 8
  - magnesian: Lesley, J.P. 30
- Dauphin Co.: D'Invilliers, E.V. 8
- Fayette Co.: Hickok, W.O. 10; Stevenson, J.J. 5
  - Brownsville-Curwensville quadrangle: Campbell, M.R. 2
- Franklin Co.: D'Invilliers, E.V. 8
  - Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
  - Hancock quadrangle: Stose, G.W. 12
- Fulton Co.: Stevenson, J.J. 8
  - Hancock-Pawpaw quadrangles: Stose, G.W. 12
  - Mercersburg quadrangle: Stose, G.W. 10
- Greene Co.: Stevenson, J.J. 3; Stone, R.W. 33
  - Amity quadrangle: Clapp, F.G. 6
  - Claysville quadrangle: Munn, M.J. 7
- Huntingdon Co.
  - analyses: Genth, F.A. 10
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Tyrone quadrangle: Butts, C. 18
- Indiana Co.
  - Barnesboro quadrangle: Campbell, M.R. 8
  - Elders Ridge quadrangle: Stone, R.W. 3, 5

  - Johnstown quadrangle: Phalen, W.C. 4
  - Latrobe quadrangle: Campbell, M.R. 6
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Jefferson Co.
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Juniata-Mifflin Cos.: D'Invilliers, E.V. 10
- Lancaster Co.: Herr, L.B. 1; Jonas, A.I. 5, 6
  - Lancaster quadrangle: Jonas, A.I. 10
  - Middletown quadrangle: Stose, G.W. 33
  - New Holland quadrangle: Jonas, A.I. 7
- Lawrence Co.: Peck, F.B. 10
  - New Castle quadrangle: De Wolf, F.W. 1
  - Zelienople quadrangle: Richardson, G.B. 12
- Lebanon Co.: D'Invilliers, E.V. 8
- Lehigh Co.: Buck, L.J. 1; Miller, B.L. 44
  - Allentown quadrangle: Miller, B.L. 14
  - Quakertown quadrangle: Bascom, F. 17
- Lycoming Co.: Sherwood, A. 2
- McKean Co.: Ashburner, C.A. 14
- Montgomery Co.: Carter, O.C.S. 1
- Northampton Co.: Miller, B.L. 28
  - Allentown quadrangle: Miller, B.L. 14
- Pennsylvania: Ashley, G.H. 76; Frear, W. 1, 3; Halberstadt, B. 3; Miller, B.L. 15, 18, 20; Swain, F.M. 2
  - analyses: Frear, W. 2; McCreath, A.S. 1, 3, 5
- Potter Co., Gaines quadrangle: Fuller, M.L. 4
- Snyder-Union Cos.: D'Invilliers, E.V. 10
- Somerset Co.: Johnson, W.R. 9
  - Johnstown quadrangle: Phalen, W.C. 4
  - Somerset-Windber quadrangles: Richardson, G.B. 11
  - Southampton Twp.: Johnson, W.R. 12
- Southeastern
  - Chester Valley: Abbey, M.B. 1
  - Precambrian: Mitman, C.W. 1
- Southwestern: Clapp, F.G. 1; Pechin, E.C. 1
- Tioga Co.: Taylor, R.C. 6
  - Gaines quadrangle: Fuller, M.L. 4
- Venango Co.
  - Foxburg quadrangle: Shaw, E.W. 4
  - southern: Fettke, C.R. 6
- Washington Co.: Stevenson, J.J. 3
  - Amity quadrangle: Clapp, F.G. 6
  - Brownsville quadrangle: Campbell, M.R. 2
  - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
  - Claysville quadrangle: Munn, M.J. 7
  - Pittsburgh quadrangle: Johnson, M.E. 9
- Western: Ashley, G.H. 40; Stone, R.W. 11
- Westmoreland Co.: Stevenson, J.J. 5
  - Connellsville quadrangle: Campbell, M.R. 2
  - Freeport quadrangle: Hughes, H.H. 1
  - Greensburg quadrangle: Johnson, M.E. 8
  - Johnstown quadrangle: Phalen, W.C. 4
  - Latrobe quadrangle: Campbell, M.R. 6
  - Pittsburgh quadrangle: Johnson, M.E. 9
  - Somerset-Windber quadrangles: Richardson, G.B. 11
- York Co.: D'Invilliers, E.V. 8; Frazer, P. 10; Jandorf, M.L. 1; Stose, G.W. 39
  - Hanover-York area: Stose, A.I.J. 1
  - Middletown quadrangle: Stose, G.W. 33

LIMONITE, *see also* Iron
- Chester Co.: Smith, J.L. 1; Thomas, C.A. 3
- Lancaster Co., pyrite pseudomorphs: Willig, H.L. 1
- Lehigh Co.: Miller, B.L. 44
- (melanosiderite), Delaware Co.: Cooke, J.P. 3
- Pennsylvania: Corbin, J.R. 3; Hickok, W.O. 9
- York Co., pyrite pseudomorphs: Holden, E.F. 1

LUZERNE COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern

Areal geology
- northern: White, I.C. 12
- Northern anthracite field: Gleason, F.A. 1
- Wilkes-Barre area: Cist, Z. 2

Economic geology
- coal, anthracite: Cist, Z. 2; Foote, F.W. 1; Gleason, F.A. 1; Gross, L.M. 1; Hill, F.A. 2; Johnson, W.R.

1; Joyce, W.E. 1; Silliman, B. 4; Wasmuth, H.A. 5
analyses: Johnson, W.R. 3
manganese: Cist, Z. 1
sand: Darton, N.H. 7

Ground water
Luzerne Co.: Lohman, S.W. 1

Historical geology
Mississippian-Pennsylvanian: Winslow, A. 2
Pennsylvanian: Darrah, W.C. 2; Gleason, F.A. 1; Hill, F.A. 2; Johnson, W.R. 11; Sheafer, P.W. 6
anthracite fields: Ashburner, C.A. 18; Miller, B.L. 25
Canal limestone: Ashburner, C.A. 35
Hillman limestone: Ashburner, C.A. 35
Mill Creek limestone: Ashburner, C.A. 35
Wilkes-Barre area: Cist, Z. 2
Silurian-Mississippian: White, I.C. 12

Maps
Geologic: Lesley, J.P. 46; White, I.C. 12; Winslow, A. 2
Eastern Middle anthracite field: Ashburner, C. A. 18
Northern anthracite field: Ashburner, C.A. 18
Wyoming Valley: Ashburner, C.A. 36
Isopach, Quarternary deposits: Darton, N.H. 8

Mineralogy
calcite; Northup, M.A. 2
chlorite: Northup, M.A. 3
dolomite: Northup, M.A. 2
gypsum: Northup, M.A. 2
halotrichite: Shrader, J.J. 1
keiserite: Northup, M.A. 2
millerite: Hawkins, A.C. 4; Northup, M.A. 1, 3
pyrite: Northup, M.A. 2, 3
pyrophyllite: Genth, F.A. 15; Northup, M.A. 3
quartz: Northup, M.A. 2
limpid, Broad Mtn.: Porter, J. 1
sphalerite: Northup, M.A. 3

Paleontology
arthropod, Pennsylvanian: Packard, A.S. 1
Devonian, in drift: Corss, F. 2
fish
Devonian, Catskill Formation: Cope, E.D. 12
Pennsylvanian: Lea, I. 8
gastropods, Pennsylvanian: Claypole, E.W. 20
insects, Pennsylvanian: Lacoe, R.D. 2; Scudder, S.H. 1, 3, 4, 5, 6, 7; Willard, B. 59
mammals, Quarternary: Leidy, J. 7
Mill Creek limestone fauna, Pennsylvanian: Ashburner, C.A. 35
pelecypods, Pennsylvanian: Claypole, E.W. 20; Girty, G.H. 2; Lea, I. 8
plants
Devonian, Catskill Formation: Arnold, C.A. 9
Pennsylvanian: Gresley, W.S. 2
reptiles, Pennsylvanian: Lacoe, R.D. 1; Packard, A.S. 1
worms, Pennsylvanian: Miller, S.A. 3
xiphosuran, Pennsylvanian, Allegheny Formation: Willard, B. 21

Petrology
coal, spheroidal: Gresley, W.S. 1

Physical geology
Lackawanna basin: Willard, B. 63
pothole, buried: Ashburner, C.A. 40
structure
anthracite basins: Lyman, B.S. 8
Lehigh River: Winslow, A. 2
Northern anthracite field: Ashburner, C.A. 18; Darton, N.H. 11
Wyoming Valley: Ashburner, C.A. 36

Physiography
buried channels
Susquehanna River: Darton, N.H. 8
Wyoming Valley: Hill, F.A. 1
buried valleys: Darton, N.H. 5; Itter, H.A. 1
post-glacial folding: Lyman, B.S. 11
drainage changes: Itter, H.A. 1
glacial geology: Itter, H.A. 1; White, I.C. 12
Wyoming Valley: Branner, J.C. 2
kames: Itter, H.A. 1
peneplains: Itter, H.A. 1
Pittston-Nanticoke glacial lake: Itter, H.A. 1
terraces: Itter, H.A. 1

LYCOMING COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern
meteorites: Owens, D.D. 1

Areal geology
Lycoming Co.: Anon. 6; Sherwood, A. 2

Economic geology
clay: Hodge, J.T. 2
coal, bituminous: Hodge, J.T. 2; Sherwood, A. 2; Sisler, J.D. 6, 27
iron: Hodge, J.T. 2; Meyer, A. 2; Sherwood, A. 2
limestone: Sherwood, A. 2
stone: Hodge, J.T. 2

- *Historical geology*
  - Devonian. Oriskany sandstone: Woolman, L. 1
  - Devonian-Pennsylvanian: Sherwood, A. 2
  - Mississippian. Mauch Chunk limestone: Meyers, A. 3
- *Maps*
  - Economic, coal, bituminous. Little Pine Creek basin: Sherwood, A. 2
  - Geologic: Lesley, J.P. 46, 47; Sherwood, A. 2
- *Mineralogy*
  - quartz: Meyer, A. 4
- *Paleontology*
  - ammonoids, Devonian: Miller, A.K. 2
- *Petrology*
  - slate: Meyer. A. 5
- *Physical geology*
  - structure: Sherwood, A. 2
- *Physiography*
  - glacial drift: Meyer, A. 1

MAGNESITE
- (breunerite), Montgomery Co.: Leeds, A.R. 2
- Chester Co.: Stone, R.W. 17. 47
- Lancaster Co.: Frazer, P. 29; Stone, R.W. 17, 47
- Philadelphia Co.: Schaeffer, F.C. 1

MAGNESIUM, *see also* magnesium-bearing minerals
- Pennsylvania: Ashley, G.H. 76

MAGNETITE, *see also* Iron
- Lebanon Co.: Ulke, T. 1
- Lehigh Co.: Miller, B.L. 44
  - Allentown quadrangle: Miller, B.L. 14
- Montgomery Co.: Haeberle, W.F. 1
- Pennsylvanian, general: Hickok. W.O. 9

MALACHITE
- Adams Co.: Eyerman, J. 1
- Chester Co.: Smith, J.L. 1
- Montgomery Co.: Schaeffer, F.C. 1
- Northampton Co.: Eyerman, J. 1

MAMMALIA, *see also* Vertebrata
- beaver, Monroe Co., Quaternary: Leidy, J. 13, 16
- bison
  - Bucks Co., post-Pliocene: Rhoads, S.N. 1
  - Pennsylvania, Quaternary: Allen. J.A. 1
- Blair Co., Quaternary: Holland, W.J. 1; Peterson, O.A. 1
- cat, Montgomery Co., Pleistocene: Cope, E.D. 10
- elephant, Allegheny-Delaware Cos.; Pleistocene: Leidy, J. 9
- hyena, Montgomery Co., Pleistocene: Cope, E.D. 10
- Luzerne Co., Quaternary: Leidy, J. 7
- mammoth, Quaternary, Fayette Co.: Barton, B.S. 1; Price, P.H. 3
- mastodon
  - Erie Co., Quaternary: Van Rensselaer, J. 1
  - Huntingdon Co., Quaternary: Robinson, C.W. 1; Will, H.C. 1
  - Pennsylvania, Quaternary: Barton. B.S. 3
- Montgomery Co.
  - Quaternary, Port Kennedy cave: Cope, E.D. 9, 11, 13; Wheatley, C.M. 2
  - Tertiary: Cope. E.D. 5
- peccary, Quaternary
  - Mifflin Co.: Leidy, J. 15. 16
  - Monroe Co.: Leidy, J. 13, 16
- Pennsylvania, Quaternary: Baird. S.F. 2
  - bone caves: Cope, E.D. 4
- Somerset Co., Mississippian: Featherstonhaugh, G.W. 1
- tiger, Montgomery Co., Pleistocene: Cope, E.D. 10
- Tioga Co., Quaternary: Edwards, T. 1
- Westmoreland Co., Pennsylvanian: King, A.T. 1, 2; Lyell, C. 3

MAN-FOSSIL
- Chester Co., post-Pleistocene: Lewis, H.C. 17
- Pennsylvania, Pleistocene: popular: Anon. 37
- Philadelphia Co., Pleistocene, artifact: Lewis, H.C. 30

MANGANESE, *see also* manganese-bearing minerals
- Adams Co., Fairfield-Gettysburg quadrangles: Stose, G.W. 27
- Bedford Co., Sherman Valley: Foose, R.M. 8; Kerns, W.H. 1
- Berks Co.: Miller, B.L. 7
- Bucks Co., Allentown quadrangle: Miller, B.L. 14
- Cumberland Co.
  - Boiling Springs area: Burton, S.E. 1
  - Fairfield quadrangle: Stose, G.W. 27
  - Reading Banks area: Foose, R.M. 8
  - White Rocks area: Foose, R.M. 14
- Eastern: Harder, E.C. 4
- Franklin Co., Fairfield quadrangle: Stose, G.W. 27
- Huntingdon Co.: Kerns, W.H. 2
- Lehigh Co.: Miller, B.L. 7, 44

    - Allentown quadrangle: Miller, B.L. 14
  - Luzerne Co.: Cist, Z. 1
  - Northampton Co.: Woodhouse, J. 1
    - Allentown quadrangle: Miller, B.L. 14
  - Pennsylvania: Ashley, G.H. 76; Foose, R.M. 7, 8; Harder, E.C. 2
    - popular: Foose, R.M. 10; Stone, R.W. 51
  - Tioga Co.: Taylor, R.C. 6
  - York Co.: Miller, B.L. 7

MAPS

Economic

- brownstone, Southeastern: Hopkins, T.C. 2
- building stone, Pennsylvanian: Stone, R.W. 31
- cement
  - Berks Co.: Miller, B.L. 19
  - Lehigh-Northampton Cos.: Miller, B.L. 19; Peck, F.B. 7
  - Pennsylvania: Burchard, E.F. 1
- coal, Pennsylvania: Averitt, P. 1; Campbell, M.R. 7, 12; Hewitt, A.S. 1; Hitchcock, C.H. 7; Lesher, C.E. 1; Owen, D.D. 1; Prime, F. 8; Sisler, J.D. 25; Tryon, F.G. 1
  - *anthracite*
    - Carbon-Schuylkill Cos.: Ashburner, C.A. 2
    - Lycoming Co., Little Pine Creek coal basin: Sherwood, A. 2
    - Northeastern: Alder and Co. 1; Ashburner, C.A. 2, 25, 26; Bowen, E. 1; Daddow, S.H. 1; Fisher, S.B. 1; Hill, F.A. 3; Smith, A. deW. 1
    - Schuylkill Co.: Ashburner, C.A. 17; Lyman, B.S. 3; Sheafer, P.W. 1
      - Tamaqua area: Koehler, H. 1
  - *bituminous*
    - Armstrong-Butler Cos., Foxburg quadrangle: Shaw, E.W. 2
    - Cambria Co.: Hogg, J.B. 1
      - Bell's coal field: Platt, F. 4
      - First bituminous basin: Platt, F. 4
    - Centre Co., Snow-Shoe coal basin: Platt, F. 1
    - Clarion Co., Foxburg quadrangle: Shaw, E.W. 2, 4
    - Clearfield Co., Steam-coal basin: Platt, F. 1
    - Fayette Co.: Hogg, J.B. 1; Platt, F. 3
    - Greene Co., coal depth: Stevenson, J.J. 3
    - McKean Co.
      - Clermont area: Ashburner, C.A. 14
      - Potato Creek area: Ashburner, C.A. 14
    - Somerset Co.: Hogg, J.B. 1; Platt, F. 4
      - Salisbury-Central coal basin: Platt, F. 4
    - Southwestern: Wall, J.S. 1
      - Pittsburgh coal: Munn, M.J. 6
    - Tioga Co., Gaines basin: Platt, F. 12
    - Venango Co., Foxburg quadrangle: Shaw, E.W. 2
    - Washington Co., coal depths: Stevenson, J.J. 3
    - Western: Halberstadt, B. 1
      - Lower Freeport coal: Sisler, J.D. 27
      - Lower Kittanning coal: Sisler, J.D. 27
      - Pittsburgh coal: Sisler, J.D. 27
    - Westmoreland Co.: Hogg, J.B. 1; Platt, F. 3
- copper, Adams-Franklin Cos., Blue Ridge area: Bevier, G.M. 1
- feldspar, Chester-Delaware Cos.: Bastin, E.S. 1; Stone, R.W. 29
- graphite, Chester Co.: Miller, B.L. 3
- ground water, Allegheny Co.: Adamson, J.H. 3
- iron
  - Adams Co.: Frazer, P. 13, 20
  - Bedford Co.: Lesley, J.P. 13
  - Cumberland Co.: D'Invilliers, E.V. 8; Frazer, P. 20; Lesley, J.P. 16; McCreath, A.S. 5
  - Dauphin Co.: D'Invilliers, E.V. 8
  - Franklin Co.: D'Invilliers, E.V. 8; Frazer, P. 20; McCreath, A.S. 5
  - Huntingdon Co.: Platt, F. 16
  - Lancaster Co.: Frazer, P. 29
  - Lehigh Co.: Prime, F. 2
    - Ironton area: Prime, F. 4
  - Pennsylvania: Hewitt, A.S. 1
  - York Co.: D'Invilliers, E.V. 8; Frazer, P. 13, 20; McCreath, A.S. 5
    - Dillsburg area: Frazer, P. 20
- limestone
  - Berks-Cumberland Cos.: D'Invilliers, E.V. 8
  - Dauphin-Franklin Cos.: D'Invilliers, E.V. 8
  - Lebanon Co.: D'Invilliers, E.V. 8
  - Pennsylvania: Miller, B.L. 15, 20; Swain, F.M. 2
  - York Co.: D'Invilliers, E.V. 8; Jandorf, M.L. 1
- mineral resources
  - Adams Co., Fairfield-Gettysburg quadrangles: Stose, G.W. 27
  - Allegheny Co.
    - Beaver quadrangle: Woolsey, L.H. 3, 4

    Brownsville quadrangle: Campbell, M.R. 2
    Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
    Pittsburgh quadrangle: Johnson, M.E. 9
    Sewickley quadrangle: Munn, M.J. 5
Armstrong Co.
    Clarion quadrangle: Shaw, E.W. 4
    Elders Ridge quadrangle: Stone, R.W. 3, 5
    Kittanning quadrangle: Butts, C. 3, 6
    Rural Valley quadrangle: Butts, C. 5, 6
    Smicksburg quadrangle: Shaffner, M.N. 3
Beaver Co.
    Beaver quadrangle: Woolsey, L.H. 3, 4
    Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
    New Castle quadrangle: De Wolf, F.W. 1
    Sewickley quadrangle: Munn, M.J. 5
    Zelienople quadrangle: Richardson, G.B. 12
Bedford Co.
    Ebensburg quadrangle: Butts, C. 4
    Windber quadrangle: Richardson, G.B. 11
Blair Co.
    Ebensburg quadrangle: Butts, C. 4
    Patton quadrangle: Campbell, M.R. 8
Butler Co.
    Butler quadrangle: Richardson, G.B. 12
    Foxburg quadrangle: Shaw, E.W. 4
    Kittanning quadrangle: Butts, C. 3, 6
    Sewickley quadrangle: Munn, M.J. 5
    Zelienople quadrangle: Richardson, G.B. 12
Cambria Co.
    Barnesboro-Patton quadrangles: Campbell, M.R. 8
    Ebensburg quadrangle: Butts, C. 4
    Johnstown quadrangle: Phalen, W.C. 3, 4
    Windber quadrangle: Richardson, G.B. 11
Clarion Co.
    Clarion quadrangle: Shaw, E.W. 4
    Kittanning quadrangle: Butts, C. 3, 6
    Rural Valley quadrangle: Butts, C. 5, 6
Clearfield Co.
    Barnesboro-Patton quadrangles: Campbell, M.R. 8
    Curwensville quadrangle: Ashley, G.H. 68
    Punxsutawney quadrangle: Ashley, G.H. 33
Cumberland Co., Fairfield quadrangle: Stose, G.W. 27
Fayette Co.
    Brownsville-Connellsville quadrangles: Campbell, M.R. 2
    Masontown-Uniontown quadrangles: Campbell, M.R. 1
    Waynesburg quadrangle: Stone, R.W. 4
Franklin Co., Fairfield quadrangle: Stose, G.W. 27
Green Co.
    Amity quadrangle: Clapp, F.G. 4, 6
    Claysville quadrangle: Munn, M.J. 7
    Masontown quadrangle: Campbell, M.R. 1
    Rogersville quadrangle: Clapp, F.G. 5
    Waynesburg quadrangle: Stone, R.W. 4
Huntingdon Co., Jackson-Baree Twps.: D'Invilliers, E.V. 10
Indiana Co.
    Barnesboro quadrangle: Campbell, M.R. 8
    Elders Ridge quadrangle: Stone, R.W. 3, 5
    Indiana quadrangle: Richardson, G.B. 2
    Johnstown quadrangle: Phalen, W.C. 3, 4
    Latrobe quadrangle: Campbell, M.R. 6
    Punxsutawney quadrangle: Ashley, G.H. 33
    Smicksburg quadrangle: Shaffner, M.N. 3
Jefferson Co.
    Punxsutawney quadrangle: Ashley, G.H. 33
    Smicksburg quadrangle: Shaffner, M.N. 3
Lancaster-Lebanon Cos., Lancaster quadrangle: Jonas, A.I. 10
Lawrence Co.
    New Castle quadrangle: De Wolf, F.W. 1
    Zelienople quadrangle: Richardson, G.B. 12
Lehigh Co.: Miller, B.L. 44
Pennsylvania: Wilson, J.F. 1
Somerset Co.
    Johnstown quadrangle: Phalen, W.C. 3, 4

    - Somerset-Windber quadrangles: Richardson, G.B. 11
  - Venango Co., Foxburg quadrangle: Shaw, E.W. 4
  - Warren Co., Warren quadrangle: Butts, C. 11
  - Washington Co.
    - Amity quadrangle: Clapp, F.G. 4, 6
    - Brownsville quadrangle: Campbell, M.R. 2
    - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
    - Claysville quadrangle: Munn, M.J. 7
    - Masontown quadrangle: Campbell, M.R. 1
    - Pittsburgh quadrangle: Johnson, M.E. 9
    - Rogersville quadrangle: Clapp, F.G. 5
    - Waynesburg quadrangle: Stone, R.W. 4
  - Westmoreland Co.
    - Connellsville quadrangle: Campbell, M.R. 2
    - Greensburg quadrangle: Johnson, M.E. 8
    - Johnstown quadrangle: Phalen, W.C. 3, 4
    - Latrobe quadrangle: Campbell, M.R. 6
    - Pittsburgh quadrangle: Johnson, M.E. 9
    - Somerset quadrangle: Richardson, G.B. 11
- natural gas
  - Clarion-Forest Cos., Oil City quadrangle: Dickey, P.A. 5
  - Crawford-Forest Cos., Titusville quadrangle: Dickey, P.A. 6
  - Forest Co.: Cathcart, S.H. 13
    - Tidioute quadrangle: Cathcart, S.H. 13
  - Jefferson Co., Reynoldsville gas-coal basin: Platt, F. 1
  - Northwestern: Grow, G.C. 1
  - Potter Co., East Fork-Wharton field: Ebright, J.R. 1
  - Southwestern: Pepper, J.F. 2
  - Venango Co.
    - Franklin-Oil City quadrangles: Dickey, P.A. 5
    - Hilliards quadrangle: Sherrill, R.E. 9
    - Titusville quadrangle: Dickey, P.A. 6
  - Warren Co.: Cathcart, S.H. 13
    - Tidioute quadrangle: Cathcart, S.H. 13
    - Titusville quadrangle: Dickey, P.A. 6
  - Western: Ashley, G.H. 29; Averitt, P. 2; Day, D.T. 3, 5; Northrop, J.D. 1; Pierce, W.G. 1; Republic Explor. Co. 1; Richardson, G.B. 5, 10; Sisler, J.D. 29
- paint ore, Carbon Co.: Hill, F.A. 4; Miller, B.L. 2
- peat, Pennsylvania: Davis, C.A. 1
- petroleum
  - Allegheny Co.: Ingham, A.I. 2
    - Carnegie quadrangle, Gordon sand: Munn, M.J. 6
  - Armstrong Co.: Carll, J.F. 3
    - Clarion quadrangle: Munn, M.J. 3
  - Beaver Co., Dry-Island Run area: White, I.C. 6
  - Butler Co.: Carll, J.F. 3
    - Hilliards quadrangle: Sherrill, R.E. 4
  - Clarion Co.: Carll, J.F. 3
    - Clarion quadrangle: Munn, M.J. 3
    - Oil City quadrangle: Dickey, P.A. 5
  - Crawford Co., Titusville quadrangle: Dickey, P.A. 6; Sherrill, R.E. 7
  - Elk Co.: Carll, J.F. 4
  - Forest Co.: Carll, J.F. 4; Cathcart, S.H. 13
    - Oil City quadrangle: Dickey, P.A. 5
    - Tidioute quadrangle: Cathcart, S.H. 13
    - Titusville quadrangle: Dickey, P.A. 6; Sherrill, R.E. 7
  - McKean Co.: Carll, J.F. 4
    - Lafayette Twp.: Fettke, C.R. 24
  - Northwestern: Grow, G.C. 1
  - Southwestern: Pepper, J.F. 2
  - Venango Co.
    - Franklin-Oil City quadrangles: Dickey, P.A. 5
    - Hilliards quadrangle: Sherrill, R.E. 4, 9
    - Titusville quadrangle: Sherrill, R.E. 7
  - Warren Co.: Carll, J.F. 4; Cathcart, S.H. 13
    - Tidioute quadrangle: Cathcart, S.H. 13
    - Titusville quadrangle: Dickey, P.A. 6; Sherrill, R.E. 7
  - Washington Co.: Ingham, A.I. 2
    - Carnegie quadrangle, Gordon sand: Munn, M.J. 6
  - Western: Averitt, P. 2; Carll, J.F. 9; Day, D.T. 3, 5; Northrop, J.D. 1; Pierce, W.G. 1; Republic Explor. Co. 1; Richardson, G.B. 5, 10; Sisler, J.D. 29; Wrigley, H.E. 1

  - oil fields: Ashburner, C.A. 14; Ashley, G.H. 29; Carll, J.F. 5
  - Oriskany sandstone: Myers, T.H. 1
- petroleum and gas
  - Allegheny Co.
    - Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
    - Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
    - Freeport quadrangle: Hughes, H.H. 1
    - Pittsburgh quadrangle: Johnson, M.E. 9
    - Sewickley quadrangle: Munn, M.J. 5
  - Armstrong Co.
    - Clarion quadrangle: Shaw, E.W. 4
    - Foxburg quadrangle: Shaw, E.W. 2
    - Freeport quadrangle: Hughes, H.H. 1
  - Beaver Co.
    - Burgettstown quadrangle: Shaw, E.W. 3
    - New Castle quadrangle: De Wolf, F.W. 1
    - Sewickley quadrangle: Munn, M.J. 5
  - Butler Co.
    - Foxburg quadrangle: Shaw, E.W. 2, 4
    - Sewickley quadrangle: Munn, M.J. 5
  - Clarion Co.
    - Clarion quadrangle: Shaw, E.W. 4
    - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Greene Co.: Stone, R.W. 8
    - Claysville quadrangle: Griswold, W.T. 2; Munn, M.J. 7
  - Lawrence Co., New Castle quadrangle: De Wolf, F.W. 1
  - McKean Co., Bradford field: Fettke, C.R. 20
  - Southwestern: Hice, R.R. 8; Munn, M.J. 1, 6; Pepper, J.F. 1
  - Venango Co.: Sherrill, R.E. 5
    - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Washington Co.
    - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
    - Burgettstown-Claysville quadrangles: Griswold, W.T. 2
    - Claysville quadrangle: Munn, M.J. 7
    - North Strabane area: Fettke, C.R. 29
    - Pittsburgh quadrangle: Johnson, M.E. 9
    - Steubenville quadrangle: Griswold, W.T. 2
  - Western: Carll, J.F. 7; Demarest, D.F. 1
  - Westmoreland Co.
    - Freeport quadrangle: Hughes, H.H. 1
    - Greensburg quadrangle: Johnson, M.E. 8
    - Pittsburgh quadrangle: Johnson, M.E. 9
- salt, Pennsylvania: B. and O. R.R., Industrial Development Staff, 1
- slate, Northampton Co.: Behre, C.H. 4
- sulphur from pyrite, Western: Leighton, H. 2

Geologic

- Adams Co.: Frazer, P. 9; Lesley, J.P. 46, 47; Stose, G.W. 21
  - Blue Ridge copper district: Wherry, E.T. 7
  - Fairfield-Gettysburg quadrangles: Stose, G.W. 27
  - Hanover quadrangle: Stose, A.I.J. 1
  - Triassic diabase: Stose, G.W. 15
- Allegheny Co.: D'Invilliers, E.V. 9; Jillson, B.C. 1; Lesley, J.P. 46, 47; Stevenson, J.J. 4, 5
  - Beaver quadrangle: Woolsey, L.H. 3
  - Brownsville quadrangle: Campbell, M.R. 2
  - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
  - Freeport quadrangle: Hughes, H.H. 1
  - northern: White, I.C. 6
  - Pittsburgh quadrangle: Johnson, M.E. 9
  - Sewickley quadrangle: Munn, M.J. 5
- Armstrong Co.: Lesley, J.P. 46, 47; Platt, W.G. 2
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3
  - Foxburg quadrangle: Shaw, E.W. 2
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
  - Smicksburg quadrangle: Shaffner, M.N. 2, 3
- Beaver Co.: Lesley, J.P. 46, 47; White, I.C. 6
  - Beaver quadrangle: Woolsey, L.H. 3
  - Burgettstown quadrangle: Shaw, E.W. 3
  - New Castle quadrangle: De Wolf, F.W. 1
    - surficial deposits: De Wolf, F.W. 1
  - Sewickley quadrangle: Munn, M.J. 5

  - Zelienople quadrangle: Richardson, G.B. 12
- Bedford Co.: Lesley, J.P. 46, 47; Platt, F. 16; Stevenson, J.J. 8
  - Broadtop basin: Gardner, J.H. 1
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - northcentral: Platt, F. 15
  - Pawpaw quadrangle: Stose, G.W. 12
  - Sherman Valley area: Foose, R.M. 8
  - Windber quadrangle: Richardson, G.B. 11
- Berks Co.: Lesley, J.P. 46, 47, 49, 63
  - Boyertown area: Spencer, A.C. 2
  - eastern: Lesley, J.P. 42
  - Jones mine area: Spencer, A.C. 2
  - New Holland quadrangle: Jonas, A.I. 7
  - northern: Lesley, J.P. 42
  - Oley Valley area: Bertelet, P.G. 1
  - Reading area: Spencer, A.C. 2; Willard, B. 48
  - Reading Prong: Lesley, J.P. 48; Stose, G.W. 36
  - slate belt: Behre, C.H. 9
  - South Mtn. area: Eaton, H.N. 1
  - Triassic: McLaughlin, D.B. 3
  - Wheatfield mine area: Spencer, A.C. 2
- bibliography: Marcou, J. 5
- Blair Co.: Lesley, J.P. 46; Platt, F. 16
  - eastern: Platt, F. 15
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg quadrangle: Butts, C. 20
  - Patton quadrangle: Campbell, M.R. 8
  - Tyrone quadrangle: Butts, C. 18
- Bradford Co.: Horton, G.F. 1; Lesley, J.P. 46, 47; Sherwood, A. 1
- Bucks Co.: Lesley, J.P. 46, 47, 67
  - Allentown quadrangle: Miller, B.L. 14
  - Doylestown-Quakertown quadrangles: Bascom, F. 17
  - Easton quadrangle, Precambrian: Bayley, W.S. 2
  - Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  - northern: Lesley, J.P. 42
  - Precambrian, Wissahickon schist: Weiss, J. 3
  - Reading Prong: Lesley, J.P. 48
  - southern: Hall, C.E. 7
  - southern gneiss complex: Armstrong, E.J. 2
  - Trenton quadrangle: Bascom, F. 19
  - Triassic: Lyman, B.S. 7
    - Lockatong Formation: McLaughlin, D.B. 7
    - Point Pleasant area: McLaughlin, D.B. 6
    - Revere area, Brunswick Formation: McLaughlin, D.B. 5
    - Stockton Formation: McLaughlin, D.B. 7
    - Tohickon Creek area: McLaughlin, D.B. 6
- Butler Co.: Lesley, J.P. 46, 47
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Kittanning quadrangle: Butts, C. 3, 6
  - northern: Chance, H.M. 4
  - Sewickley quadrangle: Munn, M.J. 5
  - southern: White, I.C. 6
- Cambria Co.: Lesley, J.P. 46; Platt, F. 4
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Ebensburg quadrangle: Butts, C. 4
  - Johnstown quadrangle: Phalen, W.C. 3
  - Windber quadrangle: Richardson, G.B. 11
- Cameron Co.: Lesley, J.P. 46, 47; Sheafer, A.W. 1
- Carbon Co.: Lesley, J.P. 46, 63
  - Eastern Middle anthracite field, Ashburner, C.A. 18
  - Lehigh River, Winslow, A. 2
  - Panther Creek coal basin: Ashburner, C.A. 2
- Centre Co.: D'Invilliers, E.V. 4; Lesley, J.P. 46, 47
  - Bellefonte quadrangle: Butts, C. 16
  - eastern: D'Invilliers, E.V. 10
  - Tyrone quadrangle: Butts, C. 18
- Chester Co.: Anon. 3; Hartmann, M.D. 1; Lesley, J.P. 41, 46, 47
  - Coatesville-West Chester quadrangles: Bascom, F. 18
  - Doe Run-Avondale area: Bliss, E.F. 2
  - Easttown-Tredyffrin Twps.: Rand, R.D. 16
  - Elktown quadrangle: Bascom, F. 13
  - French Creek area: Smith, L.L. 2
  - Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  - Honeybrook uplift: Stose, G.W. 37
  - Phoenixville mining district: Miller, B.L. 13
  - Quarryville quadrangle: Jonas, A.I. 6; Knopf, E.F.B. 4
- Clarion Co.: Carll, J.F. 3; Chance, H.M. 6; Lesley, J.P. 46, 47
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Shaw, E.W. 4
  - Foxburg quadrangle: Shaw, E.W. 2, 4

  Kittanning quadrangle: Butts, C. 3, 6
  Rural Valley quadrangle: Butts, C. 5, 6
Clearfield Co.: Chance, H.M. 14; Lesley, J.P. 46, 47
  Barnesboro-Patton quadrangles: Campbell, M.R. 8
  Curwensville quadrangle: Ashley, G.H. 68
  Punxsutawney quadrangle: Ashley, G.H. 33
Clinton Co.: Chance, H.M. 7; Lesley, J.P. 46, 47
Columbia Co.: Lesley, J.P. 46, 47; White, I.C. 12
Crawford Co.: Lesley, J.P. 46, 47; White, I.C. 9
Cumberland Co.: Lesley, J.P. 37, 46, 47
  Fairfield quadrangle: Stose, G.W. 27
  Reading ore banks: Foose, R.M. 8
  White Rocks area: Foose, R.M. 14
Dauphin Co.: Lesley, J.P. 46, 47, 63
  Middletown quadrangle: Stose, G.W. 33
  Southern anthracite field: Ashburner, C.A. 18
Delaware Co.: Hall, C.E. 9; Lesley, J.P. 46, 47
  Haverford-Marple Twps.: Rand, T.D. 16
  Newton-Radnor Twps.: Rand, T.D. 16
  West Chester quadrangle: Bascom, F. 18
Eastern: Cook, G.H. 1; Kerr, P.F. 1
Elk Co.: Ashburner, C.A. 28; Lesley, J.P. 46, 47
Erie Co.: Lesley, J.P. 46, 47; White, I.C. 9
Fayette Co.: D'Invilliers, E.V. 9; Hickok, W.O. 10; Lesley, J.P. 46, 47; Stevenson, J.J. 5
  Accident-Grantsville quadrangles: Martin, G.C. 3
  Brownsville-Connellsville quadrangles: Campbell, M.R. 2
  Masontown-Uniontown quadrangles: Campbell, M.R. 1
  Waynesburg quadrangle: Stone, R.W. 4
  western: Stevenson, J.J. 4
Forest Co.: Ashburner, C.A. 29; Lesley, J.P. 46, 47
Franklin Co.: Lesley, J.P. 46, 47; Sanders, R.H. 1
  Blue Ridge copper district: Wherry, E.T. 7
  Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
  Fairfield quadrangle: Stose, G.W. 27
  Hancock quadrangle: Stose, G.W. 12
Fulton Co.: Lesley, J.P. 46, 47; Stevenson, J.J. 8
  Broadtop basin: Gardner, J.H. 1
  Hancock-Pawpaw quadrangles: Stose, G.W. 12
  Mercersburg quadrangle: Stose, G.W. 10
  Sideling Hill Creek area: Dewees, J.H. 1
Greene Co.: D'Invilliers, E.V. 9; Lesley, J.P. 46, 47; Stevenson, J.J. 3, 5; Stone, R.W. 33
  Amity quadrangle: Clapp, F.G. 4
  Claysville quadrangle: Munn, M.J. 7
  Masontown quadrangle: Campbell, M.R. 1
  Rogersville quadrangle: Clapp, F.G. 5
  Waynesburg quadrangle: Stone, R.W. 4
Huntingdon Co.: Lesley, J.P. 46, 50; Platt, F. 16; White, I.C. 14
  Broadtop basin: Gardner, J.H. 1
  East Broadtop Railroad area: Dewees, J.H. 1
  Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  northwestern: D'Invilliers, E.V. 10
  Orbisonia area: Dewees, J.H. 1; Platt, F. 16
  Sideling Hill-Three Springs area: Dewees, J.H. 1
  Tyrone quadrangle: Butts, C. 18
  western: Platt, F. 15
Indiana Co.: Lesley, J.P. 46, 47; Platt, W.G. 1
  Barnesboro quadrangle: Campbell, M.R. 8
  Elders Ridge quadrangle: Stone, R.W. 3
  Indiana quadrangle: Richardson, G.B. 2
  Johnstown quadrangle: Phalen, W.C. 3
  Latrobe quadrangle: Campbell, M.R. 6
  Punxsutawney quadrangle: Ashley, G.H. 33
  Smicksburg quadrangle: Shaffner, M.N. 2, 3
Jefferson Co.: Lesley, J.P. 46, 47; Platt, W.G. 3
  Brookville quadrangle: Graeber, C.K. 3
  Punxsutawney quadrangle: Ashley, G.H. 33
  Smicksburg quadrangle: Shaffner, M.N. 2, 3
Juniata Co.: D'Invilliers, E.V. 10; Lesley, J.P. 46
Lackawanna Co.: Lesley, J.P. 46; White, I.C. 10, 12

  - Northern anthracite field: Ashburner, C.A. 18
- Lancaster Co.: Frazer, P. 29; Lesley, J.P. 46, 47
  - Coatesville quadrangle: Bascom, F. 18
  - Honeybrook quadrangle: Bascom, F. 21
  - Honeybrook uplift: Stose, G.W. 37
  - Lancaster quadrangle: Jonas, A.I. 10
  - McCalls Ferry-Quarryville quadrangles: Knopf, E.F.B. 4
  - Middletown quadrangle: Stose, G.W. 33
  - New Holland quadrangle: Jonas, A.I. 7
  - Peach Bottom slate area: Behre, C.H. 9
  - Quarryville quadrangle: Jonas, A.I. 6
  - South Mtn. area: Eaton, H.N. 1
  - southern: Cloos, E. 3
- Lawrence Co.: Lesley, J.P. 46, 47; White, I.C. 5
  - New Castle quadrangle: De Wolf, F.W. 1
    - surficial deposits: De Wolf, F.W. 1
  - Zelienople quadrangle: Richardson, G.B. 12
- Lebanon Co.: Lesley, J.P. 46
  - Cornwall area: Spencer, A.C. 2
  - Lancaster quadrangle: Jonas, A.I. 10
  - Middletown quadrangle: Stose, G.W. 33
  - Reading Prong: Stose, G.W. 36
  - South Mtn. area: Eaton, H.N. 1
  - Southern anthracite field: Ashburner, C.A. 18
- Lehigh Co.: D'Invilliers, E.V. 2; Lesley, J.P. 42, 46, 47; Miller, B.L. 44; Prime, F. 4
  - Allentown quadrangle: Miller, B.L. 14
  - cement district: Eckel, E.C. 2, 4
  - eastern: Peek, F.B. 8
  - Quakertown quadrangle: Bascom, F. 17
  - Reading Prong: Lesley, J.P. 48; Stose, G.W. 36
  - slate belt: Behre, C.H. 9
  - Slatedale-Slatington area: Behre, C.H. 9
- Luzerne Co.: Lesley, J.P. 46; White, I.C. 12
  - Lehigh River: Winslow, A. 2
  - Northern and Middle Eastern anthracite fields: Ashburner, C.A. 18
  - Wyoming Valley: Ashburner, C.A. 36
- Lycoming Co.: Lesley, J.P. 46, 47; Sherwood, A. 2
- McKean Co.: Ashburner, C.A. 14; Lesley, J.P. 46, 47
  - Alton coal basin: Ashburner, C.A. 14; Lesley, J.P. 51
  - Bradford quadrangle: Fettke, C.R. 20
- Mercer Co.: Lesley, J.P. 46, 47; White, I.C. 7
- Mifflin Co.: D'Invilliers, E.V. 10; Lesley, J.P. 46; Platt, F. 16
  - northern: D'Invilliers, E.V. 10
- Monroe Co.: Lesley, J.P. 46, 47; Wagner, N.S. 1; White, I.C. 11
  - Delaware water gap: Willard, B. 40
- Montgomery Co.: Carter, O.C.S. 1; Lesley, J.P. 46, 67
  - Lower-Upper Darby Twps.: Rand, T.D. 16
  - Lower Merion Twp.: Rand, T.D. 16
  - Phoenixville mining district: Miller, B.L. 13
  - Quakertown quadrangle: Bascom, F. 17
  - southern: Hall, C.E. 7
  - southern gneiss complex: Armstrong, E.J. 2
- Montour Co.: Lesley, J.P. 46, 47; White, I.C. 12
- Northampton Co.: Lesley, J.P. 42, 46, 47; Miller, B.L. 35; Peek, F.B. 8
  - Allentown quadrangle: Miller, B.L. 14
  - Bangor-Windgap area: Behre, C.H. 4, 9
  - cement district: Eckel, E.C. 2, 4
  - Danielsville-Lehigh River area: Behre, C.H. 9
  - Delaware Water Gap quadrangle, Precambrian: Bayley, W.S. 2
  - Easton quadrangle, Precambrian: Bayley, W.S. 2
  - Reading Prong: Lesley, J.P. 48
  - slate belt: Behre, C.H. 4, 9
- Northcentral: Lohman, S.W. 3
  - Pleistocene deposits: Lohman, S.W. 3
- Northeastern: Lohman, S.W. 1
  - anthracite fields: Ashburner, C.A. 25; Rogers, H.D. 22
  - Devonian, Catskill facies: Willard, B. 53
  - Devonian-Mississippian: Willard, B. 31
  - Triassic: Lyman, B.S. 6
- Northumberland Co.: Lesley, J.P. 46, 47; White, I.C. 12
  - Western Middle anthracite field: Ashburner, C.A. 18
- Northwestern: Leggette, R.M. 1
  - Pleistocene deposits: Leverett, F. 1
  - Pleistocene gravel: Leggette, R.M. 1
- Pennsylvania: Boyd, C.R. 1; Bradley, F.H. 1; Credner, H. 1; Hall, J. 2; Hitchcock, C.H. 5, 6, 9; Lesley, J.P. 17, 67; Lobeck, A.K. 1; Logan,

W.E. 2; Lyell, C. 2; Maclure, W. 1; McGee, WJ 1, 3; Marcou, J. 1, 2, 4, 5; Rogers, H.D. 23; Stose, G.W. 30, 31, 43; Williams, W.A. 1; Willis, B. 5, 7
  glacial deposits: Torbert, J.B. 1
Perry Co.: Claypole, E.W. 16; Dewees, J.H. 2; Lesley, J.P. 46, 47
Philadelphia Co.: Hall, C.E. 7; Jewell, W. 1; Lesley, J.P. 46, 47
  Philadelphia Twp.: Rand, T.D. 16
  Precambrian, Wissahickon schist: Weiss, J. 3
  Trenton quadrangle: Bascom, F. 10
Pike Co.: Lesley, J.P. 46, 47; Wagner, N.S. 1; White, I.C. 11
Potter Co.: Lesley, J.P. 46, 47; Sherwood, A. 3
  Gaines quadrangle: Fuller, M.L. 4
Schuylkill Co.: Lesley, J.P. 46, 63; Sheafer, P.W. 1
  Eastern Middle anthracite field: Ashburner, C.A. 18
  Moorea-New Boston area: Lyman, B.S. 2
  Panther Creek coal basin: Ashburner, C.A. 2
  Shippen-Wetherill coal tract: Lyman, B.S. 5
  Southern anthracite field: Ashburner, C.A. 18
  Western Middle anthracite field: Ashburner, C.A. 18
Snyder Co.: D'Invilliers, E.V. 10; Lesley, J.P. 46
Somerset Co.: Lesley, J.P. 46; Platt, F. 4
  Accident-Grantsville quadrangles: Martin, G.C. 3
  Johnstown quadrangle: Phalen, W.C. 3
  Somerset-Windber quadrangles: Richardson, G.B. 11
Southcentral: Lohman, S.W. 2
  Harrisburg-Newport area: Willard, B. 41
Southeastern: Hall, C.E. 6; Hall, G.M. 1; Walcott, C.D. 8
  Chester Valley, sketch: Mackin, J.H. 3
  dikes: Lewis, H.C. 38
  Newark basin: Carlston, C.W. 1
  road-log strips: Stose, G.W. 32
Southwestern: Carll, J.F. 7; D'Invilliers, E.V. 9; Hice, R.R. 7; Leighton, H. 5; Piper, A.M. 1
  Mississippian-Permian: Clapp, F.G. 1
Sullivan Co.: Lesley, J.P. 46, 47; Platt, F. 9
  Bernice-Loyalsock coal basins: Ashburner, C.A. 32
Susquehanna Co.: Lesley, J.P. 46, 47
  Northern anthracite field: Ashburner, C.A. 18
Tioga Co.: Lesley, J.P. 46, 47; Sherwood, A. 1
  Elkland-Tioga quadrangles: Fuller, M.L. 3
  Gaines quadrangle: Fuller, M.L. 4
Union Co.: D'Invilliers, E.V. 10; Lesley, J.P. 46; Platt, F. 16
  northern: D'Invilliers, E.V. 10
Venango Co.: Lesley, J.P. 46, 47
  Foxburg quadrangle: Shaw, E.W. 2, 4
Warren Co.: Lesley, J.P. 46, 47
  Warren quadrangle: Butts, C. 11
Washington Co.: D'Invilliers, E.V. 9; Lesley, J.P. 46, 47; Stevenson, J.J. 3, 5
  Amity quadrangle: Clapp, F.G. 4
  Brownsville quadrangle: Campbell, M.R. 2
  Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
  Claysville quadrangle: Munn, M.J. 7
  Masontown quadrangle: Campbell, M.R. 1
  Pittsburgh quadrangle: Johnson, M.E. 9
  Rogersville quadrangle: Clapp, F.G. 5
  Waynesburg quadrangle: Stone, R.W. 4
Wayne Co.: Lesley, J.P. 46, 47; White, I.C. 10
  Northern anthracite field: Ashburner, C.A. 18
Western: Sayler, N. 1; White, I.C. 18
  Catskill red beds: Carll, J.F. 9
Westmoreland Co.: D'Invilliers, E.V. 9; Lesley, J.P. 46, 47; Stevenson, J.J. 5
  Connellsville quadrangle: Campbell, M.R. 2
  Freeport quadrangle: Hughes, H.H. 1
  Greensburg quadrangle: Johnson, M.E. 8
  Johnstown quadrangle: Phalen, W.C. 3
  Latrobe quadrangle: Campbell, M.R. 6
  Pittsburgh quadrangle: Johnson, M.E. 9
  Somerset quadrangle: Richardson, G.B. 11
  western: Stevenson, J.J. 4
Wyoming Co.: Lesley, J.P. 46, 47; White, I.C. 11, 12
York Co.: Frazer, P. 29, 37; Lesley, J.P. 46, 47; Stose, G.W. 39
  Dillsburg area: Spencer, A.C. 2

    - Hanover-York quadrangles. Stose, A.I.J. 1
    - McCalls Ferry quadrangle: Knopf, E.F.B. 4
    - Middletown quadrangle: Stose, G.W. 33
    - Peach Bottom slate area: Behre, C.H. 9
    - Triassic diabase: Stose, G.W. 15

Geophysical
- gravity
    - Eastern: Woollard, G.P. 2, 3
    - Pennsylvania: Woollard, G.P. 4

Isograd
- Southeastern, Glenarm series: McKinstry, H.E. 4

Isopach
- Allegheny Co., Gordon sand, Devonian: Ingham, A.I. 3
- Butler Co., Hilliards quadrangle, Shira sand: Sherrill, R.E. 7
- Luzerne Co., Quaternary deposits: Darton, N.H. 8
- McKean Co., Music Mtn. field, Sliverville sand: Fettke, C.R. 25
- Northwestern
    - Silurian: Rittenhouse, G. 3
    - Venango district
        - Second oil sand: Sherrill, R.E. 7
        - Third stray sand: Sherrill, R.E. 7
- Pennsylvania
    - Appalachian geosyncline: Fisher, R.A. 1
    - Cambrian: Ver Weibe, W.A. 7
    - Devonian: Ver Weibe, W.A. 7
    - Mississippian: Ver Weibe, W.A. 7
    - Ordovician: Ver Weibe, W.A. 7
    - Pennsylvanian: Ver Weibe, W.A. 7
    - Permian: Ver Weibe, W.A. 7
    - Silurian: Ver Weibe, W.A. 7
- Southwestern
    - Devonian sandstones: Matteson, L.S. 1
    - Mississippian, Berea sandstone: Pepper, J.F. 1
    - Mississippian sandstones: Matteson, L.S. 1; Pepper, J.F. 2
    - Pennsylvanian sandstones: Matteson, L.S. 1
- Venango Co., Franklin quadrangle, Devonian sands: Sherrill, R.E. 5
- Washington Co., Gordon sand, Devonian: Ingham, A.I. 3
- Western
    - Mississippian sands: Demarest, D.F. 1
    - Ordovician, Queenston shale: Rittenhouse, G. 6
    - Pennsylvanian, Vanport limestone: Swain, F.M. 2

Isovol
- Pennsylvania: Sisler, J.D. 20
- petroleum and gas: Cathcart, S.H. 7

Paleogeographic
- Eastern, Devonian, Chemung shore line: Willard, B. 20
- Northwestern, Pleistocene valleys: Leggette, R.M. 1
- Pennsylvania
    - Paleozoic: Willis, B. 6
    - Mesozoic: Willis, B. 6
    - Tertiary: Willis, B. 6

Physiographic
- Monroe Co., glacial features: White, I.C. 11
- Northeastern, kames: Lewis, H.C. 40
- Northwestern
    - drainage changes: Carll, J.F. 3
    - pre-glacial drainage: Lesley, J.P. 51
- Pennsylvania
    - glacial deposits: Ashley, G.H. 52; Chamberlin, T.C. 6; Flint, R.F. 1; Leverett, F. 5; Torbert, J.B. 1
    - Harrisburg peneplain: Campbell, M.R. 3
    - Schooley peneplain: Ver Steeg, K. 7
    - terminal moraine: Lesley, J.P. 51; Lewis, H.C. 37
- Pike-Wayne Cos., glacial features: White, I.C. 11

Soil
- Southeastern: Shaw, C.F. 1

Structural
- Adams Co., Fairfield-Gettysburg quadrangles: Stose, G.W. 27
- Allegheny Co.
    - Beaver quadrangle: Woolsey, L.H. 3
    - Brownsville quadrangle: Campbell, M.R. 2
- Beaver Co., Beaver quadrangle: Woolsey, L.H. 3
- Bedford Co.
    - Ebensburg quadrangle: Butts, C. 4
    - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
    - Pawpaw quadrangle: Stose, G.W. 12
    - Windber quadrangle: Richardson, G.B. 11
- Blair Co.
    - Ebensburg quadrangle: Butts, C. 4
    - Hollidaysburg quadrangle: Butts, C. 20
- Bucks Co.
    - southern gneiss complex: Armstrong, E.J. 2
    - Wissahickon schist, Precambrian: Weiss, J. 3
- Cambria Co.
    - Ebensburg quadrangle: Butts, C. 4
    - Windber quadrangle: Richardson, G.B. 11

Cameron Co.: Cathcart, S.H. 10
  fold axes: Ashburner, C.A. 28
Chester Co., Coatesville-Westchester quadrangles: Bascom, F. 18
Clarion Co.: Lesley, J.P. 51
Clearfield Co., anticlinal axes: Platt, F. 1
Cumberland Co., Fairfield quadrangle: Stose, G.W. 27
Delaware Co., West Chester quadrangle: Bascom, F. 18
Elk Co.: Cathcart, S.H. 9; Lesley, J.P. 51
  fold axes: Ashburner, C.A. 28
Fayette Co.: Moyer, F.T. 1; Hickok, W.O. 10
  Brownsville-Connellsville quadrangles: Campbell, M.R. 2
  Masontown quadrangle: Campbell, M.R. 1
Forest Co.: Lesley, J.P. 51
  fold axes: Ashburner, C.A. 28
  Tidioute quadrangle: Cathcart, S.H. 13
Franklin Co.
  Fairfield quadrangle: Stose, G.W. 27
  Hancock quadrangle: Stose, G.W. 12
Fulton Co., Hancock-Pawpaw quadrangles: Stose, G.W. 12
Greene Co., Masontown quadrangle: Campbell, M.R. 1
Huntingdon Co., Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
Indiana Co., Latrobe quadrangle: Campbell, M.R. 6
Lancaster Co., Coatesville quadrangle: Bascom, F. 18
McKean Co.: Cathcart, S.H. 8; Lesley, J.P. 51
  fold axes: Ashburner, C.A. 28
Montgomery Co., southern gneiss complex: Armstrong, E.J. 2
Northern: Cathcart, S.H. 7; Robinson, J.F. 6
Pennsylvania: Longwell, C.R. 2; Republic. Explor. Co. 1
Philadelphia Co., Wissahickon schist: Weiss, J. 3
Potter Co.: Cathcart, S.H. 5
  Gaines quadrangle: Fuller, M.L. 4
Somerset Co., Somerset-Windber quadrangles: Richardson, G.B. 11
Southwestern: Hice, R.R. 7
Tioga Co.
  Bradford sand: Fettke, C.R. 18
  Gaines quadrangle: Fuller, M.L. 4
  Tioga region: Cathcart, S.H. 3
Warren Co., Tidioute quadrangle: Cathcart, S.H. 13
Washington Co.
  Brownsville quadrangle: Campbell, M.R. 2
  Masontown quadrangle: Campbell, M.R. 1
Western: Postley, O.C. 2
  anticlines: Grow, G.C. 1
  structural axes: Torrey, P.D. 3
Westmoreland Co.
  Connellsville quadrangle: Campbell, M.R. 2
  Latrobe quadrangle: Campbell, M.R. 6
  Somerset quadrangle: Richardson, G.B. 11

Structure contour
  Allegheny Co.
    Ames limestone, Pennsylvanian: Munn, M.J. 4
    Beaver quadrangle, Upper Freeport coal: Woolsey, L.H. 3, 4
    Brownsville quadrangle, Pittsburgh coal: Campbell, M.R. 2
    Burgettstown quadrangle, Pittsburgh coal: Griswold, W.T. 1, 2
    Burgettstown-Carnegie quadrangles, Pittsburgh coal: Shaw, E.W. 3
    Fifth sand, Devonian: Ingham, A.I. 2
    Fourth sand
      Hopper field: Ingham, A.I. 2
      Moon Run-Crafton fields: Ingham, A.I. 2
    Freeport quadrangle, Upper Freeport coal: Hughes, H.H. 1
    Gordon sand, Devonian: Ingham, A.I. 2
    Greensburg quadrangle: Johnson, M.E. 1
    Hundred foot sand, Devonian: Munn, M.J. 4
    McDonald oil field: Ingham, A.I. 3
    Mississippian-Pennsylvanian sands: Ingham, A.I. 2
    Pittsburgh area: Johnson, M.E. 4
    Pittsburgh coal: Ashley, G.H. 21; D'Invilliers, E.V. 6; Ingham, A.I. 2
    Pittsburgh quadrangle, Pittsburgh coal: Johnson, M.E. 9
    Sewickley quadrangle
      Ames limestone, Pennsylvanian: Munn, M.J. 5
      Hundred foot sand, Devonian: Munn, M.J. 5
  Armstrong Co.
    Catskill Formation, Devonian: Shaffner, M.N. 3
    Clarion quadrangle
      Lower Kittanning coal: Munn, M.J. 3
      Vanport limestone, Pennsylvanian: Shaw, E.W. 4

  - Elders Ridge quadrangle, Upper Freeport coal: Stone, R.W. 3, 5
  - Foxburg quadrangle, Vanport limestone, Pennsylvanian: Shaw, E.W. 2
  - Freeport quadrangle, Upper Freeport coal: Hughes, H.H. 1
  - Kittanning quadrangle, Vanport limestone, Pennsylvanian: Butts, C. 3, 6
  - Rural Valley quadrangle, Vanport limestone, Pennsylvanian: Butts, C. 5, 6
  - Smicksburg quadrangle, Freeport coal: Shaffner, M.N. 2
- Beaver Co.
  - Ames limestone, Pennsylvanian: Munn, M.J. 4
  - Beaver quadrangle, Upper Freeport coal: Woolsey, L.H. 3, 4
  - Burgettstown quadrangle, Pittsburgh coal: Griswold, W.T. 1, 2; Shaw, E.W. 3
  - Hundred foot sand, Devonian: Munn, M.J. 4
  - New Castle quadrangle, Middle Kittanning coal: De Wolf, F.W. 1
  - Sewickley quadrangle
    - Ames limestone, Pennsylvanian: Munn, M.J. 5
    - Hundred foot sand, Devonian: Munn, M.J. 5
  - Zelienople quadrangle, Vanport limestone, Pennsylvanian: Richardson, G.B. 12
- Bedford Co.
  - Broadtop field, Kelly coal: Gardner, J.H. 1
  - Ebensburg quadrangle, Upper Freeport coal: Butts, C. 4
  - Windber quadrangle, Lower Kittanning coal: Richardson, G.B. 11
- Blair Co.
  - Ebensburg quadrangle, Upper Freeport coal: Butts, C. 4
  - Patton quadrangle, Lower Freeport coal: Campbell, M.R. 8
- Butler Co.
  - Ames limestone, Pennsylvanian: Munn, M.J. 4
  - Butler quadrangle, Vanport limestone, Pennsylvanian: Richardson, G.B. 12
  - Foxburg quadrangle, Vanport limestone, Pennsylvanian: Shaw, E.W. 2, 4
  - Hilliards quadrangle, Shira sand, Devonian: Sherrill, R.E. 7
  - Hundred foot sand, Devonian: Munn, M.J. 4
  - Kittanning quadrangle, Vanport limestone, Pennsylvanian: Butts, C. 3, 6
  - Sewickley quadrangle
    - Ames limestone, Pennsylvanian: Munn, M.J. 5
    - Hundred foot sand, Devonian: Munn, M.J. 5
  - Zelienople quadrangle, Vanport limestone, Pennsylvanian: Richardson, G.B. 12
- Cambria Co.
  - Barnesboro-Patton quadrangles, Lower Freeport coal: Ashley, G.H. 10; Campbell, M.R. 8
  - Ebensburg quadrangle, Upper Freeport coal: Butts, C. 4
  - Johnstown quadrangle, Lower Kittanning coal: Phalen, W.C. 4
  - Windber quadrangle, Lower Kittanning coal: Richardson, G.B. 11
- Centre Co., Houtzdale quadrangle, Lower Freeport coal: Ashley, G.H. 10
- Clarion Co.
  - Brookville quadrangle, Vanport limestone, Pennsylvanian: Graeber, C.K. 2
  - Clarion quadrangle
    - Lower Kittanning coal: Munn, M.J. 3
    - Vanport limestone, Pennsylvanian: Shaw, E.W. 4
  - Foxburg quadrangle, Vanport limestone, Pennsylvanian: Shaw, E.W. 2, 4
  - Kittanning quadrangle, Vanport limestone, Pennsylvanian: Butts, C. 3, 6
  - Oil City quadrangle, Devonian sands: Dickey, P.A. 4
  - Rural Valley quadrangle, Vanport limestone, Pennsylvanian: Butts, C. 5, 6
- Clearfield Co.
  - Barnesboro-Patton quadrangles, Lower Freeport coal: Ashley, G.H. 10; Campbell, M.R. 8
  - Curwensville-Houtzdale quadrangles, Lower Freeport coal: Ashley, G.H. 10
  - Punxsutawney quadrangle, Lower Freeport coal: Ashley, G.H. 10
- Crawford Co.
  - Berea sandstone, Mississippian: De Witt, W. 1
  - Devonian sands: Dickey, P.A. 2
- Fayette Co.
  - Brownsville-Connellsville quadrangles, Pittsburgh coal: Campbell, M.R. 2
  - Masontown-Uniontown quadrangles: Campbell, M.R. 1
  - Waynesburg quadrangle, Pittsburgh coal: Stone, R.W. 4

- Forest Co.
  - Devonian sands: Cathcart, S.H. 13; Dickey, P.A. 2
  - Oil City quadrangle: Dickey, P.A. 4
- Fulton Co., Broadtop field, Kelly coal: Gardner, J.H. 1
- Greene Co.
  - Amity quadrangle, Pittsburgh coal: Clapp, F.G. 4
  - Claysville quadrangle
    - Gordon sand: Griswold, W.T. 2; Munn, M.J. 7
    - Pittsburgh coal: Griswold, W.T. 2
    - Washington Formation, Permian: Munn, M.J. 7
  - Masontown quadrangle, Pottsville sandstone, Pennsylvanian: Campbell, M.R. 1
  - Pittsburgh coal: Stone, R.W. 8, 33
  - Rogersville quadrangle, Pittsburgh coal: Clapp, F.G. 5
  - Waynesburg quadrangle, Pittsburgh coal: Stone, R.W. 4
- Huntingdon Co., Broadtop field, Kelly coal: Gardner, J.H. 1
- Indiana Co.
  - Barnesboro quadrangle. Lower Freeport coal: Campbell, M.R. 8
  - Barnesboro-Punxsutawney quadrangles, Lower Freeport coal: Ashley, G.H. 10
  - Catskill Formation, Devonian: Shaffner, M.N. 3
  - Elders Ridge quadrangle, Upper Freeport coal: Stone, R.W. 3, 5
  - Indiana quadrangle, Upper Freeport coal: Richardson, G.B. 2
  - Johnstown quadrangle, Lower Kittanning coal: Phalen, W.C. 3, 4
  - Latrobe quadrangle, Pottsville sandstone, Pennsylvanian: Campbell, M.R. 6
  - Smicksburg quadrangle, Freeport coal: Shaffner, M.N. 2
- Jefferson Co.
  - Brookville quadrangle, Vanport limestone, Pennsylvanian: Graeber, C.K. 2
  - Catskill Formation, Devonian: Shaffner, M.N. 3
  - Punxsutawney quadrangle, Lower Freeport coal: Ashley, G.H. 10
  - Smicksburg quadrangle, Freeport coal: Shaffner, M.N. 2
- Lawrence Co.
  - New Castle quadrangle, Middle Kittanning coal: De Wolf, F.W. 1
  - Zelienople quadrangle, Vanport limestone, Pennsylvanian: Richardson, G.B. 12
- McKean Co., Bradford sand, Devonian: Fettke, C.R. 16, 20, 24, 25
- Northern, Oriskany sandstone, Devonian: Ingham, A.I. 1
- Northwestern
  - Helderberg limestone, Devonian: Carll, J.F. 9
  - Oriskany sandstone, Devonian: Fettke, C.R. 14
  - Trenton limestone, Ordovician: Fettke, C.R. 30
  - Venango district
    - Second oil sand, Devonian: Sherrill, R.E. 7
    - Third stray sand, Devonian: Sherrill, R.E. 7
- Potter Co.
  - Oriskany sandstone, Devonian: Finn, F.H. 1
  - Wolf Creek conglomerate, Devonian: Finn, F.H. 1
- Somerset Co.
  - Johnstown quadrangle, Lower Kittanning coal: Phalen, W.C. 3, 4
  - Somerset quadrangle
    - Johnstown limestone, Pennsylvanian: Richardson, G.B. 11
    - Lower Kittanning coal: Richardson, G.B. 11
  - Windber quadrangle, Lower Kittanning coal: Richardson, G.B. 11
- Southwestern, Pittsburgh coal: Stone, R.W. 16
- Tioga Co.
  - Oriskany sandstone, Devonian: Finn, F.H. 1; Torrey, P.D. 3
  - Tioga gas field
    - Oriskany sandstone, Devonian: Cathcart, S.H. 6; Robinson, J.F. 6
    - Tully limestone, Devonian: Robinson, J.F. 6
  - Wolf Creek conglomerate, Devonian: Finn, F.H. 1
- Venango Co.
  - Devonian sands: Dickey, P.A. 2
  - Foxburg quadrangle, Vanport limestone, Pennsylvanian: Shaw, E.W. 2, 4
  - Franklin quadrangle
    - Corry sand, Mississippian: Sherrill, R.E. 5
    - Devonian sands: Sherrill, R.E. 5
    - Oil City quadrangle, Devonian sands: Dickey, P.A. 4
- Warren Co.
  - Devonian sands: Cathcart, S.H. 13; Dickey, P.A. 2
  - Warren quadrangle, Clarendon sand, Devonian: Butts, C. 11
- Washington Co.
  - Amity quadrangle, Pittsburgh coal: Clapp, F.G. 4

  - Brownsville quadrangle, Pittsburgh coal: Campbell, M.R. 2
  - Burgettstown quadrangle, Pittsburgh coal: Griswold, W.T. 1, 2; Shaw, E.W. 3
  - Carnegie quadrangle, Pittsburgh coal: Shaw, E.W. 3
  - Claysville quadrangle
    - Gordon sand: Griswold, W.T. 2; Munn, M.J. 7
    - Washington Formation, Permian: Griswold, W.T. 2; Munn, M.J. 7
  - Fifth sand, Devonian: Ingham, A.I. 2
  - Fourth sand, Devonian, Venice field: Ingham, A.I. 2
  - Gordon sand, Devonian: Ingham, A.I. 2
  - McDonald oil field: Ingham, A.I. 3
  - Masontown quadrangle, Pottsville sandstone, Pennsylvanian: Campbell, M.R. 1
  - Mississippian sands: Ingham, A.I. 2
  - Pennsylvanian sands: Ingham, A.I. 2
  - Pittsburgh coal: Ingham, A.I. 2
  - Pittsburgh quadrangle, Pittsburgh coal: Johnson, M.E. 9
  - Rogersville quadrangle, Pittsburgh coal: Clapp, F.G. 5
  - Steubenville quadrangle
    - Berea sandstone, Mississippian: Griswold, W.T. 2
    - Pittsburgh coal: Griswold, W.T. 2
  - Waynesburg quadrangle, Pittsburgh coal: Stone, R.W. 4
- Western
  - Devonian: Finn, F.H. 1
    - Oriskany sandstone: Fettke, C.R. 19, 26
  - Pittsburgh coal: Ashley, G.H. 29
  - Pittsburgh-Huntingdon basin: Richardson, G.B. 7
- Westmoreland Co.
  - Connellsville quadrangle, Pittsburgh coal: Campbell, M.R. 2
  - Freeport quadrangle, Upper Freeport coal: Hughes, H.H. 1
  - Greensburg quadrangle: Johnson, M.E. 1
  - Johnstown quadrangle, Lower Kittanning coal: Phalen, W.C. 3, 4
  - Latrobe quadrangle
    - Pittsburgh coal: Campbell, M.R. 6
    - Pottsville sandstone, Pennsylvanian: Campbell, M.R. 6
  - Pittsburgh quadrangle, Pittsburgh coal: Johnson, M.E. 9
  - Somerset quadrangle
    - Johnstown limestone, Pennsylvanian: Richardson, G.B. 11
    - Lower Kittanning coal: Richardson, G.B. 11

MARBLE, *see also* Stone
- Chester Co.: Lesley, J.P. 41
- Montgomery Co., peculiar marks: Browne, J.B. 1
- Southeastern: Anon. 2; Ashley, G.H. 76

MARCASITE
- Armstrong Co.: Hamilton, H.V. 1

MARGARITE, *see also* Mica
- Chester Co.: Smith, J.L. 1
- (corundellite), Chester Co.: Hermann, R. 3; Silliman, B., Jr. 3
- (emerylite), Chester Co.: Hermann, R. 3; Smith, J.L. 1
- (lesleyite), Chester Co.: Lea, I. 15; Smith, J.L. 2

MARL
- Pennsylvania: Dickey, F.B.R. 1

McKEAN COUNTY, *see also* Pennsylvania, Pennsylvania-Northern, and Pennsylvania-Western

Areal geology
- McKean Co.: Ashburner, C.A. 14

Economic geology
- clay: Ashburner, C.A. 14
- coal, bituminous: Ashburner, C.A. 14; Lesley, J.P. 51; Needham, B. 1; Owen, D.D. 1; Sisler, J.D. 14, 27
- coal, cannel: Needham, B. 1
- iron: Ashburner, C.A. 14
- limestone: Ashburner, C.A. 14
- natural gas: Ashburner, C.A. 14; Cathcart, S.H. 8
- paint ore: Ashburner, C.A. 14
- petroleum: Ashburner, C.A. 9, 14; Carll, J.F. 2, 4, 9; Fettke, C.R. 10, 16, 24; Newby, J.B. 1
  - Bradford field: Fettke, C.R. 20
  - Music Mtn. field: Fettke, C.R. 25
- stone: Ashburner, C.A. 14; Phalen, W.C. 6

Ground water
- Bradford quadrangle: Fettke, C.R. 20
- geysers: Ashburner, C.A. 10
- McKean Co.: Ashburner, C.A. 5
- mineral springs: Ashburner, C.A. 14
- spouting well: Ashburner, C.A. 5

Historical geology
- Cambrian-Pennsylvanian: Torrey, P.D. 3
- Devonian: Ashburner, C.A. 9; Fettke, C.R. 20, 28
  - Bradford sand: Ashburner, C.A. 12; Fettke, C.R. 10; Waldo, A.W. 1
  - Sliverville sand: Fettke, C.R. 25
- Devonian-Mississippian: Ashburner, C.A. 8, 14
- Devonian-Pennsylvanian: Ashburner, C.A. 28; Fettke, C.R. 24

Silurian-Pennsylvanian: Cathcart, S.H. 8

Maps

Economic
coal, bituminous: Ashburner, C.A. 14
petroleum: Carll, J.F. 4; Lesley, J.P. 51
Lafayette Twp.: Fettke, C.R. 24
oil fields: Ashburner, C.A. 14
petroleum and gas, Bradford field: Fettke, C.R. 20
Geologic: Ashburner, C.A. 14; Lesley, J.P. 46, 47
Alton coal basin: Ashburner, C.A. 14; Lesley, J.P. 51
Bradford quadrangle: Fettke, C.R. 20
Isopach, Music Mtn. oil field, Sliverville sand, Devonian: Fettke, C.R. 25
Structure: Cathcart, S.H. 8; Lesley, J.P. 51
fold axes: Ashburner, C.A. 28
Structure contour
Bradford oil field, Bradford sand, Devonian: Fettke, C.R. 20
Bradford third sand, Devonian: Fettke, C.R. 16
Lafayette Twp., Bradford sand, Devonian: Fettke, C.R. 24, 25

Paleontology

brachiopods, Devonian: Simpson, G.B. 2
eurypterids, Devonian, Chemung group: Ehlers, G.M. 1
plants
Devonian
Catskill Formation: Arnold, C.A. 9
Chemung group, seeds: Arnold, C.A. 4
Mississippian; Pocono sandstone: Arnold, C.A. 1, 2, 3
xiphosuran, Devonian: Eller, E.R. 2

Petrology

Bradford third sand, Devonian: Fary, R.W. 1; Fettke, C.R. 10; Waldo, A.W. 1
Haskell sandstone, Devonian: Fary, R.W. 1

Physiography

Lake Wright, Pleistocene: Williams, E.H. 13

MEANDERS, *see also* Drainage patterns
Bedford-Huntingdon Cos., Juniata River: Stone, R.W. 40
Cumberland Co., Conodoguinet Creek: Strahler, A.N. 2

MELACONITE, *see* Zincite

MELANITE, *see* Garnet

MELANOSIDERITE, *see* Limonite

MENACCONITE, *see* Ilmenite

MERCER COUNTY, *see also* Pennsylvania, and Pennsylvania-Western

Areal geology

Mercer Co.: Griswold, E. 1; White, I.C. 7

Economic geology

coal, bituminous: Chance, H.M. 3; Griswold, E. 1; Sisler, J.D. 14, 27; White, I.C. 7
iron: White, I.C. 7
petroleum: Carll, J.F. 2, 4, 9

Ground water

Mercer Co.: Leggette, R.M. 1

Historical geology

Mississippian-Pennsylvanian: Griswold, E. 1
Mississippian-Pleistocene: White, I.C. 7
Pennsylvanian: Chance, H.M. 3

Maps

Geologic: Lesley, J.P. 46, 47; White, I.C. 7

Paleontology

cockroaches, Pennsylvanian: Cockerell, T.D.A. 1

Physical geology

earthquakes: Neumann, F. 1

Physiography

glacial geology: White, I.C. 7
kames: Lewis, H.C. 40
Shenango quadrangle: Kohler, F.W. 1

MESOLITE
Berks Co.: Sadtler, B. 1

MESOZOIC, *see also* individual periods
Lehigh Co.: Miller, B.L. 47
Northampton Co.: Miller, B.L. 29, 39
Pennsylvania: Ashley, G.H. 44; Claypole, E.W. 24; Hunt, T.S. 4; Miller, S.A. 1; Nelson, W.A. 1; Rogers, H.D. 25; Schuchert, C. 21
popular: Ashley, G.H. 65

METAMORPHISM
Pennsylvania: Stevenson, J.J. 9
Southeastern, Wissahickon schist: Bell, J. 1

METAMORPHIC ROCKS, *see also* individual types
Adams Co., Blue Ridge: Bascom, F. 4
amphibolite, Delaware Co.: Goldsmith, E. 1
Bucks Co.: Weiss, J. 1
Franklin Co., Blue Ridge: Bascom, F. 4

metagabbro, Bucks Co.: Weiss, J. 2
mica schist, Philadelphia Co.: Rand, T.D. 25
mylonite, Bucks-Montgomery Cos.: Armstrong, E.J. 2
perido-steatite, Delaware Co.: Bascom, F. 3
Southeastern: Hunt, T.S. 2
Glenarm series, mineral isograds: McKinstry, H.E. 4
volcanics: Williams, G.H. 5

METEORITES
Adams Co.: Gordon, S.G. 12; Howell, E.E. 1
popular: Stone, R.W. 49
Allegheny Co.: Cohen, E.W. 1; Leighton, H. 1; Silliman, B., Jr. 7
popular: Stone, R.W. 58
Butler Co.: Smithsonian Inst. 1
Chicora area: Preston, F.W. 1
popular: Anon. 57
Centre Co.: Keely, F.J. 1
popular: Anon. 59
Clarion Co., error: Stone, R.W. 37
Lycoming Co.: Owens, D.D. 1
Pennsylvania: Stone, R.W. 21, 34
popular: Anon. 31
statistics: Stone, R.W. 38
Somerset Co.: Gordon, S.G. 12; Merrill, G.P. 6
York Co.: Farrington, O.C. 1; Gordon, S.G. 12

MICA, *see also* Vermiculite and other micaceous minerals
biotite, Northampton Co.: Bauer, M. 1; Eyerman, J. 6; Grailich, J. 1; Knop, A. 1
Bucks Co.: Morton, S.G. 1
Allentown quadrangle: Miller, B.L. 14
Easton quadrangle: Bayley, W.S. 2
Chester Co.: Leeds, A.R. 8
inclusion: Rand, T.D. 13
Delaware Co.: Sterrett, D. 1
inclusions: Rand, T.D. 13
euphyllite, Chester Co.: Hermann, R. 3; Silliman, B., Jr. 3; Smith, J.L. 1
Lehigh Co., Allentown quadrangle: Miller, B.L. 14
lepidolite, Lebanon Co.: Eyerman, J. 1
muscovite
Bucks Co.: Neminarz, E.F. 2
Chester Co.: Lewis, H.C. 31
(damourite), Berks Co.: Genth, F.A. 18
Delaware Co.: Lewis, H.C. 31
(fuchsite), Chester Co.: Wherry, E.T. 17
Philadelphia Co.: Lewis, H.C. 31
Northampton Co.: Rammelsburg, C.F. 2
Allentown quadrangle: Miller, B.L. 14
Easton-Delaware water gap quadrangles: Bayley, W.S. 2
Pennsylvania: Ashley, G.H. 76
Philadelphia Co.: Carpenter, G.W. 1
lepidomelane inclusions: Lewis, H.C. 13
white: Postel, A.W. 6
sericite, Berks-Lehigh-Northampton Cos.: Fraser, D.M. 5
Southeastern: Silliman, B., Jr. 6

MICROCLINE, *see* Feldspar

MIFFLIN COUNTY, *see also* Pennsylvania, and Pennsylvania-Central

Areal geology
Mifflin Co.: D'Invilliers, E.V. 10

Economic geology
glass sand: D'Invilliers, E.V. 10
iron: Dewees, J.H. 1; D'Invilliers, E.V. 10
limestone: D'Invilliers, E.V. 10

Historical geology
Ordovician-Devonian: D'Invilliers, E.V. 10
Silurian: Swartz, F.M. 5

Maps
Geologic: D'Invilliers, E.V. 10; Lesley, J.P. 46; Platt, F. 16
northern: D'Invilliers, E.V. 10

Mineralogy
strontianite: Lewis, H.C. 1

Paleontology
brachiopods
Silurian: Simpson, G.B. 2
Keefer sandstone: Barnsley, E.R. 1
fucoids, Silurian; Harlan, R. 1; James, J.F. 2, 3; Taylor, R.C. 2, 3
peccary, Quaternary: Leidy, J. 15, 16
pelecypods, Silurian: Simpson, G.B. 2
trilobites, Ordovician: Simpson, G.B. 2

Physical geology
cave concretions: Stone, R.W. 32
structure: D'Invilliers, E.V. 10

Physiography
Lake, Kishacoquilla valley: Taylor, R.C. 4

MILLERITE
Lancaster Co.: Blake, W.P. 2
Luzerne Co.: Hawkins, A.C. 4; Northup, M.A. 1, 3
Philadelphia Co.: Rand, T.D. 7

MIMETITE
Chester Co.: Smith, J.L. 1

MINERAL COLLECTING, *see also* Counties, *Mineralogy*
- Bucks Co.: Benge, E. 2; Carpenter, G.W. 3; Vanartsdalen, J.F. 1
- Chester Co.: Benge, E. 2; Carpenter, G.W. 2, 3; Lea, I. 1; Rand, T.D. 21
  - Brinton's quarry: McKinstry, H.E. 1
  - French Creek area: Chamberlin, B.B. 1
  - West Chester area: Finch, J. 3
- Delaware Co.: Benge, E. 2; Hall, C.E. 9; Lea, I. 1
- Lancaster Co.: Beck, H.H. 1
  - New Texas area: Gordon, S.G. 5
- Lehigh Co.: Miller, B.L. 44
- Montgomery Co.: Benge, E. 2; Lea, I. 1; Rand, T.D. 21
- Pennsylvania: Dana, E.S. 3; Genth, F.A. 11, 12; Gordon, S.G. 7; Robinson, S. 1
- Philadelphia Co.: Benge, E. 2; Carpenter, G.W. 3; Lea, I. 1; Rand, T.D. 21
  - Fairmount Park: Groth, E.A. 2
- Southeastern: Eyerman, J. 3; Gordon, S.G. 13; Leonhard, G. 1; Seybert, A. 2

MINERAL COLLECTIONS
- W.W. Jefferies: Pennypacker, C.H. 1

MINERAL RESOURCES, *see also* individual types
- Pennsylvania
  - general: Ashley, G.H. 53
  - popular: Anon. 45; Ashley, G.H. 44
- Western: Von Bernwitz, M.W. 1

MINERAL SPRINGS, *see also* Springs, and Ground water
- Allegheny Co.: Meade, W. 2
- Bedford Co.: Stevenson, J.J. 8
- Fayette Co., Wharton Twp.: Stevenson, J.J. 5
- McKean Co.: Ashburner, C.A. 14
- Westmoreland Co., Fairfield Twp.: Stevenson, J.J. 5

MINERALOGY, *see also* individual species
- Bucks Co., Vanartsdalen quarry: Vanartsdalen, J.F. 2
- Chester Co.
  - gems: Taber, T. 1
  - Swarthmore quarry: Borden, H.C. 1
- Lehigh Co.: Miller, B.L. 44
- Montgomery Co., Perkiomen mines: Tomlinson, W.H. 1
- Northampton Co., list: Miller, B.L. 34
- Southeastern, Triassic zonation: Newhouse, W.H. 1

MISSISSIPPIAN, *see also* Paleozoic
- Allegheny Co.: Ingham, A.I. 2; Phalen, W.C. 6; White, I.C. 20
  - Beaver quadrangle: Woolsey, L.H. 4
  - Brownsville quadrangle: Campbell, M.R. 2
  - Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
  - Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
  - Freeport quadrangle: Hughes, H.H. 1
  - Pittsburgh quadrangle, oil sands: Johnson, M.E. 6
  - Sewickley quadrangle: Munn, M.J. 5
- Armstrong Co.: Lesley, J.P. 11; Lucas, D.J. 1
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Foxburg quadrangle: Shaw, E.W. 2
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C. 3
  - Pocono Formation: Campbell, M.R. 4
  - Rural Valley quadrangle: Butts, C. 5
  - Smicksburg quadrangle: Shaffner, M.N. 2, 3
- Beaver Co.
  - Beaver quadrangle: Woolsey, L.H. 4
  - Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
  - Sewickley quadrangle: Munn, M.J. 5
- Bedford Co.: Miller, E. 1; Reger, D.B. 1; Stevenson, J.J. 8
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Pawpaw quadrangle: Stose, G.W. 12
  - Windber quadrangle: Richardson, G.B. 11
- Blair Co.: Platt, F. 6, 15; Swartz, F.M. 17; White, C.D. 4
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg quadrangle: Butts, C. 20
  - Patton quadrangle: Campbell, M.R. 8
  - Tyrone quadrangle: Butts, C. 18
- Bradford Co.: Torrey, P.D. 3
- Butler Co.: Chance, H.M. 4; Lucas, D.J. 1
  - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Hilliards quadrangle: Sherrill, R.E. 9
  - Kittanning quadrangle: Butts, C. 3
  - Sewickley quadrangle: Munn, M.J. 5
- Cambria Co.: Miller, E. 1
  - Ebensburg quadrangle: Butts, C. 4
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - Windber quadrangle: Richardson, G.B. 11

Cameron Co.: Ashburner, C.A. 28; Cathcart, S.H. 10
Carbon Co.: Ashburner, C.A. 24; Winslow, A. 2
Central: Willard, B. 46
Centre Co.: D'Invilliers, E.V. 4; Taylor, R.C. 1
  Bellefonte quadrangle: Butts, C. 16
  Tyrone quadrangle: Butts, C. 18
Clarion Co.: Chance, H.M. 6; Lucas, D.J. 1
  Brookville quadrangle: Graeber, C.K. 2, 3
  Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4
  Foxburg quadrangle: Shaw, E.W. 2, 4
  Kittanning quadrangle: Butts, C. 3
  Oil City quadrangle: Dickey, P.A. 4, 5
  Rural Valley quadrangle: Butts, C. 5
Clearfield Co., Curwensville quadrangle: Ashley, G.H. 68
Clinton Co.: Chance, H.M. 1, 2, 7; Ulmer, L.J. 1
Columbia Co.: White, I.C. 12
Crawford Co.: De Witt, W. 1; Prosser, C.S. 4; White, I.C. 9
  Titusville quadrangle: Dickey, P.A. 6
Dauphin Co., Willard, B. 46, 67
Elk Co.: Ashburner, C.A. 8, 16, 28; Cathcart, S.H. 9
Erie Co.: Torrey, P.D. 3; White, I.C. 9
Fayette Co.: Hickok, W.O. 10; Moyer, F.T. 2; Stevenson, J.J. 5
  Accident-Grantsville quadrangles: Martin, G.C. 3
  Brownsville-Connellsville quadrangles: Campbell, M.R. 2
  Ligonier Valley: Stevenson, J.J. 5
  Masontown-Uniontown quadrangles: Campbell, M.R. 1
  Waynesburg quadrangle: Stone, R.W. 4
  western: Stevenson, J.J. 4
Forest Co.: Ashburner, C.A. 28
  Oil City quadrangle: Dickey, P.A. 4, 5
  Tidioute quadrangle: Cathcart, S.H. 13
  Titusville quadrangle: Dickey, P.A. 6
Franklin Co., Hancock quadrangle: Stose, G.W. 12
Fulton Co.: Stevenson, J.J. 8
  Hancock-Pawpaw quadrangles: Stose, G.W. 12
Greene Co.: Stone, R.W. 1, 8
  Amity quadrangle: Clapp, F.G. 4, 6
  Carnegie quadrangle: Munn, M.J. 7
  Rogersville quadrangle: Clapp, F.G. 5
  Waynesburg quadrangle: Stone, R.W. 4
Huntingdon Co.: Ashburner, C.A. 1, 3, 4, 6; Miller, E. 1; Reger, D.B. 1; White, I.C. 14
  Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  Tyrone quadrangle: Butts, C. 18
Indiana Co.: Anderson, W. 1; Fettke, C.R. 27; Platt, W.G. 1
  Elders Ridge quadrangle: Stone, R.W. 3, 5
  Indiana quadrangle: Richardson, G.B. 2
  Johnstown quadrangle: Phalen, W.C. 3, 4
  Latrobe quadrangle: Campbell, M.R. 6
  Smicksburg quadrangle: Shaffner, M.N. 2, 3
Jefferson Co.: Platt, W.G. 3
  Brookville quadrangle: Graeber, C.K. 2, 3
  Smicksburg quadrangle: Shaffner, M.N. 2, 3
Lackawanna Co.: White, I.C. 12
Lawrence Co.: Lesley, J.P. 22
Luzerne Co.: White, I.C. 12; Winslow, A. 2
Lycoming Co.: Sherwood, A. 2
  Mauch Chunk limestone: Meyer, A. 3
McKean Co.: Ashburner, C.A. 8, 14, 28; Cathcart, S.H. 8; Fettke, C.R. 24; Torrey, P.D. 3
Mercer Co.: Griswold, E. 1; White, I.C. 7
Monroe Co.: Wagner, N.S. 1; White, I.C. 11; Willard, B. 40
Montour Co.: White, I.C. 12
Northeastern: Rogers, H.D. 3, 5; Willard, B. 31
  anthracite region: Ashburner, C.A. 21
Northern: Cathcart, S.H. 10; Chance, H.M. 5; Hall, J. 5; Taylor, R.C. 5; Torrey, P.D. 3; Willard, B. 62
  Pocono Formation: Chadwick, G.H. 4
Northumberland Co.: White, I.C. 12; Willard, B. 46
Northwestern: Carll, J.F. 2, 3, 4; Caster, K.E. 2, 3, 5, 7; Fettke, C.R. 12; Girty, G.H. 1; Glenn, L.C. 1; Lesley, J.P. 51; Rogers, H.D. 3; Swartz, C.C. 1; Ver Wiebe, W.A. 3
  New York-Ohio correlations: Lesley, J.P. 21
Pennsylvania: Arnold, C.A. 6; Barrell, J. 3; Beck, R.W. 1; Butts, C. 9, 19; Cheney, M.G. 1; Cooper, B.N. 1; Eaton, A. 2; Honess, C.W. 1; Hopkins, T.C. 3; Jongmans, W.J. 5; Kay, G.M. 3; Lesley, J.P. 67; Lesquereux, L. 7, 8; Marcou, J.

  - 3; Moore, R.C. 2, 3, 4; Rigney, H.W. 1; Rogers, H.D. 2; Rogers, W.B. 5; Schuchert, C. 3, 23; Stevens, R.P. 2; Stevenson, J.J. 4, 19; Swartz, F.M. 22; Weller, J.M. 1; Weller, S. 2, 4; Ulrich, E.O. 1; Ver Weibe, W.A. 4, 7; Vicaire, A. 1; Waterschoot van der Gracht, W.A.J.M. 1; Williams, H.S. 6; Willis, B. 8
  - catalogue: Lesley, J.P. 57
  - climate: White, C.D. 11
  - continental deposits: Willard, B. 55
  - Mauch Chunk Formation: Barrell, J. 3; Stevenson, J.J. 17
  - overlap: Grabau, A.W. 5
  - Pocono sandstone: Ashley, G.H. 57; Claypole, E.W. 22; Halberstadt, B. 4; White, C.D. 13
- Perry Co.: Willard, B. 33
- Pike Co.: Wagner, N.S. 1; White, I.C. 11
- Potter Co.: Ashburner, C.A. 11, 30; Cathcart, S.H. 5; Platt, F. 10; Torrey, P.D. 3
  - East Fork-Wharton area: Ebright, J.R. 1
  - Gaines quadrangle: Fuller, M.L. 4
- Schuylkill Co.: Sheafer, P.W. 1; Willard, B. 47
- Somerset Co.: Hodge, J.T. 1
  - Accident-Grantsville quadrangles: Martin, G.C. 3
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - Mauch Chunk Formation: Stone, R.W. 41, 43
  - Somerset-Windber quadrangles: Richardson, G.B. 11
- Southwestern: Aiken, W.E.A. 1; Butts, C. 8; Caster, K.E. 7; Hice, R.R. 7; Lafferty, R.C. 1; Laird, W.M. 2; Matteson, L.S. 1; Pepper, J.F. 1, 2; Robinson, J.F. 4; Rogers, H.D. 3, 4
  - Greenbrier limestone: Rittenhouse, G. 4
- Susquehanna Co.: Torrey, P.D. 3; White, I.C. 10
- Tioga Co.: Ashley, G.H. 49; Cathcart, S.H. 6; Fettke, C.R. 17; Torrey, P.D. 3; White, I.C. 25
  - Elkland-Tioga quadrangles: Fuller, M.L. 3
  - Gaines quadrangle: Fuller, M.L. 4
- Venango Co.: Ashburner, C.A. 28; Carll, J.F. 1
  - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Franklin quadrangle: Dickey, P.A. 5; Sherrill, R.E. 5
  - Hilliards quadrangle: Sherrill, R.E. 9
  - Oil City quadrangle: Dickey, P.A. 4, 5
  - Titusville quadrangle: Dickey, P.A. 6
- Warren Co.: Hall, J. 8; Randall, F.A. 1; Torrey, P.D. 3
  - Tidioute quadrangle: Cathcart, S.H. 13
  - Titusville quadrangle: Dickey, P.A. 6
  - Warren quadrangle: Butts, C. 11
- Washington Co.: Anon. 11; Ingham, A.I. 2; White, I.C. 24, 25
  - Amity quadrangle: Clapp, F.G. 4, 6
  - Brownsville quadrangle: Campbell, M.R. 2
  - Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
  - Carnegie quadrangle: Munn, M.J. 6, 7; Shaw, E.W. 3
  - Loyalhanna limestone: Linn, A. 1
  - Rogersville quadrangle: Clapp, F.G. 5
  - Steubenville quadrangle: Griswold, W.T. 2
  - Waynesburg quadrangle: Stone, R.W. 4
- Wayne Co.: Torrey, P.D. 3; White, I.C. 10
- Western: Ashburner, C.A. 7, 15; Ashley, G.H. 51; Bownocker, J.A. 1; Carll, J.F. 2, 7, 9; Caster, K.E. 6, 12; Day, D.T. 2; Demarest, D.F. 1; Fettke, C.R. 26; Lesley, J.P. 8, 9; Majorelle, J. 1; Martens, J.H. 1, 2; Norten, P.F. 1; Otsuka, S. 1; Rittenhouse, G. 1, 2; Savage, T.E. 1; Sisler, J.D. 26, 28; Stevenson, J.J. 10; Ver Wiebe, W.A. 1, 5
  - Loyalhanna limestone: Butts, C. 14
- Westmoreland Co.: Stevenson, J.J. 5; White, I.C. 25
  - Connellsville quadrangle: Campbell, M.R. 2
  - Freeport quadrangle: Hughes, H.H. 1
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - Latrobe quadrangle: Campbell, M.R. 6
  - Ligonier Valley: Stevenson, J.J. 5
  - Somerset quadrangle: Richardson, G.B. 11
  - western: Stevenson, J.J. 4
- Wyoming Co.: Hill, F.A. 5; White, I.C. 12
  - popular: Maxwell, V.L. 1

MOLYBDENITE
- Berks Co.: Wetherill, C.M. 1
- Chester Co.: Carendeffez, B. 1
- Delaware Co.: Seybert, A. 3

Philadelphia Co.: Brown, A.P. 2; Silliman, B. 1
  epidote-bearing: Lewis, H.C. 7

MONAZITE
Delaware Co.: Hamilton, S.H. 1; Wherry, E.T. 2, 25

MONROE COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern

Areal geology
Monroe Co.: White, I.C. 11
Pocono area, popular: Myers, R.E. 5
Pocono plateau: Wagner, N.S. 1

Economic geology
clay: Reis, H. 5
  Saylorsburg area: Peck, F.B. 9
gold, Juniata conglomerate: Corbin, J.R. 6
kaolin: Leighton, H. 7

Ground water
Monroe Co.: Lohman, S.W. 1

Historical geology
Devonian: Prosser, C.S. 2, 3
Devonian-Mississippian: Wagner, N.S. 1
Ordovician-Pennsylvanian: Willard, B. 40
Silurian-Devonian: O'Neill, W.F. 1
Silurian-Pennsylvanian: White, I.C. 11

Maps
Geologic: Lesley, J.P. 46, 47; Wagner, N.S. 1; White, I.C. 11
  Delaware water gap: Willard, B. 40
Physiographic, glacial features: White, I.C. 11

Paleontology
beaver, Quaternary: Leidy, J. 13, 16
brachiopod, Devonian, Hamilton group: Willard, B. 34
coral reef, Devonian: Willard, B. 30
Devonian, Marcellus fauna: Willard, B. 7
Devonian fauna: Prosser, C.S. 2
nautiloid, Devonian: Van Tuyl, F.M. 1
peccary, Quaternary: Leidy, J. 13, 16
trilobite, Devonian, Stormville shale: Heilprin, A. 1
vertebrates, Pleistocene: Darton, N.H. 1; Mercer, H.C. 1

Petrology
limestone, columnar jointing: O'Neill, W.F. 2

Physical geology
structure
  Delaware water gap: Chance, H.M. 10
  Godfrey Ridge: O'Neill, W.F. 1

Physiography
Delaware River valley: Happ, S.C. 1
Delaware water gap: Stose, G.W. 14; Walter, E. 1
deltas, Delaware River: Happ, S.C. 2
glacial geology: Hall, C.E. 1; White, I.C. 11
glacial striae, Pocono Knob: Kummel, H.B. 1
kames: Lewis, H.C. 40
peneplains: Happ, S.C. 1
Wind Gap area: Mackin, J.H. 5
Wind Gap, origin: Wright, F.B. 1

MONTGOMERY COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Southeastern

Areal geology
Chester-Germantown quadrangles: Bascom, F. 9
Lower Darby-Lower Merion Twps.: Rand, T.D. 16
Montgomery Co.: Carter, O.C.S. 1
Norristown area: Brown, R. 1
Norristown quadrangle: Bascom, F. 9
Piedmont region: Rand, T.D. 17
Quakertown quadrangle: Bascom, F. 17
southern: Hall, C.E. 7
Upper Darby Twp.: Rand, T.D. 16

Economic geology
chromite: Corbin, J.R. 4
clay: Carter, O.C.S. 1; Hopkins, T.C. 8
coal, bituminous, Triassic: Carter, O.C.S. 6
  Norristown quadrangle: Bascom, F. 9
copper: Anon. 4; Bascom, F. 9; Carter, O.C.S. 1; Lyman, B.S. 9
feldspar: Stone, R.W. 29
  orthoclase: Carter, O.C.S. 3
gold: Carter, O.C.S. 1
  Audubon area: Corbin, J.R. 6
graphite: Carter, O.C.S. 1
iron: Carter, O.C.S. 1
kaolin: Carter, O.C.S. 1
lead: Bascom, F. 9
  Phoenixville area: Miller, B.L. 11
  Triassic: Lyman, B.S. 7
lignite: Carter, O.C.S. 1
limestone: Carter, O.C.S. 1
quartz: Carter, O.C.S. 1
serpentine: Carter, O.C.S. 1
silver: Carter, O.C.S. 1
stone: Bascom, F. 9; Carter, O.C.S. 1
  Triassic: Lyman, B.S. 7
zinc, Phoenixville area: Miller, B.L. 11

Ground water
Philadelphia district: Bascom, F. 7
springs: Foose, R.M. 4; Manners, J. 1
well logs: Carter, O.C.S. 2

Historical geology
- Cambrian sandstone: Rand, T.D. 11
- Jurassic lignite: Lewis, H.C. 5
- Oligocene, Brandon lignite: Lewis, H.C. 15
- Pleistocene, Port Kennedy cave: Heilprin, A. 3
- Precambrian-Ordovician: Frazer, P. 36; Rand, T.D. 17
- Precambrian-Tertiary
  - Chester-Germantown quadrangles: Bascom, F. 9
  - Norristown quadrangle: Bascom, F. 9
- Precambrian-Triassic: Hall, C.E. 7
  - Quakertown quadrangle: Bascom, F. 17
- Tertiary lignite: Lewis, H.C. 5
- Triassic: Lyman, B.S. 6, 7, 12; Morningstar, H. 1; Wherry, E.T. 6
  - Brunswick Formation: McLaughlin, D.B. 2
  - continuity of strata: McLaughlin, D.B. 9
  - popular: Myers, R.E. 4

Maps
- Geologic: Carter, O.C.S. 1; Lesley, J.P. 46, 67
  - Lower Darby-Lower Merion Twps.: Rand, T.D. 16
  - Phoenixville mining district: Miller, B.L. 13
  - Quakertown quadrangle: Bascom, F. 17
  - southern: Hall, C.E. 7
  - southern gneiss complex: Armstrong, E.J. 2
  - Upper Darby Twp.: Rand, T.D. 16
- Structural
  - southern gneiss complex: Armstrong, E.J. 2

Mineralogy
- absolite: Lewis, H.C. 3
- anglesite: Lang, V. 1
- barite: Lewis, H.C. 1
- breunerite: Leeds, A.R. 2
- calcite: Haeberle, W.F. 1; Thomas, C.A. 2, 7
- cerussite: Boucot, A.J. 1
- chabazite: Haeberle, W.F. 1
- chalcocite: Eyerman, J. 1
- chalcopyrite: Boucot, A.J. 1; Haeberle, W.F. 1
- chalcotrichite: Blake, W.P. 2
- chrysocolla: Boucot, A.J. 1
- datolite: Wherry, E.T. 6
- dendrites: Lewis, H.C. 10
- dolomite, bone replacement: Goldsmith, E. 2
- epidesmine: Thomas, C.A. 2
- epidote: Thomas, C.A. 7
- galena: Boucot, A.J. 1
- genthite: Lewis, H.C. 39
- gold: Wetherill, C.M. 1
- hematite: Schaeffer, F.C. 1
- herrengrundite: Boucot, A.J. 1
- magnetite: Haeberle, W.F. 1
- malachite: Schaeffer, F.C. 1
- mineral collecting: Benge, E. 2; Lea, I. 1; Rand, T.D. 21
- morganite: Haeberle, W.F. 1
- natrolite: Haeberle, W.F. 1; Thomas, C.A. 2
- orthoclase: Carter, O.C.S. 3
- Perkiomen mines: Tomlinson, W.H. 1
- pyrite: Haeberle, W.F. 1
- pyromorphite: Boucot, A.J. 1; Gordon, S. 1
- quartz: Benge, E. 1; Schaeffer, F.C. 1
- serpentine: Rand, T.D. 3
- sphalerite: Boucot, A.J. 1
- stilbite: Haeberle, W.F. 1
- wulfenite: Boucot, A.J. 1
- zeolites: Thomas, C.A. 7; Wherry, E.T. 6

Paleontology
- branchiopods, Triassic, Lockatong Formation: Bock, W. 2
- cat, Pleistocene: Cope, E.D. 10
- dinosaur, Triassic, tracks: Lyman, B.S. 12
- fish, Triassic: Bryant, W.L. 2; Lea, I. 12; Leidy, J. 11
- hyena, Pleistocene: Cope, E.D. 10
- insects, Quaternary: Horn, G.H. 1
- mammals
  - Pleistocene, Port Kennedy cave: Cope, E.D. 9, 11. 13
  - Tertiary: Cope, E.D. 5
- plants
  - Triassic: Lyman, B.S. 12
  - ferruginized: Carter, O.C.S. 8
- reptiles
  - Pleistocene, Port Kennedy cave: Cope, E.D. 13
  - Triassic, Lockatong Formation: Bock, W. 1; Colbert, E.H. 2
- tiger, Pleistocene: Cope, E.D. 10
- vertebrate bone, dolomitized: Goldsmith, E. 2
- vertebrates, Pleistocene, Port Kennedy cave: Cope, E.D. 9; Mercer, H.C. 3; Wheatley, C.M. 2

Petrology
- diabase, Triassic: Jonas, A.I. 3; Wherry, E.T. 6
- Glenarm series, mineral isograds: McKinstry, H.E. 4
- gneiss: Armstrong, E.J. 2
  - hybridization: Armstrong, E.J. 1
- marks on marble: Browne, J.B. 1
- mylonites: Armstrong, E.J. 2

  phonolite: Goldsmith, E. 1
  serpentine, Lower Merion area: Rand, T.D. 16
  volcanic rocks: Goldsmith, E. 3
 Physical geology
  cave, Port Kennedy area, bone-bearing: Mercer, H.C. 2, 3
  metamorphism: Lewis, H.C. 41
  sink holes: Foose, R.M. 4
  structure, Piedmont region: Rand, T.D. 17
  thrust fault: Frazer, P. 36
  volcanic crater: Goldsmith, E. 4

MONTMORILLONITE
  Delaware Co.: Tomlinson, W. Harold 1

MONTOUR COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern
 Areal geology
  Montour Co.: White, I.C. 12
 Economic geology
  iron: Stock, H.H. 1
 Ground water
  Montour Co.: Lohman, S.W. 1
 Historical geology
  Silurian-Mississippian: White, I.C. 12
 Maps
  Geologic: Lesley, J.P. 46, 47; White, I.C. 12

MOONSTONE, *see* Orthoclase

MORAINES
  Erie Co.: Leverett, F. 6
  Northern: Lewis, H.C. 34, 37; Wahnschaffe, F. 1; Wright, G.F. 2
  Tioga Co., Elkland-Tioga quadrangles: Fuller, M.L. 3

MORGANITE, *see* Beryl

MOROXITE, *see* Apatite

MUSCOVITE, *see* Mica

NATROLITE
  Montgomery Co.: Haeberle, W.F. 1; Thomas, C.A. 2

NATURAL GAS, *see also* Petroleum and gas
  Allegheny Co.: Ashley, G.H. 21; Ingham, A.I. 2; Robinson, J.F. 1
   Beaver quadrangle: Woolsey, L.H. 3, 4
   Boyd's Hill well log: Lesley, J.P. 27
   Brownsville quadrangle: Campbell, M.R. 2
   Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
   Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
   Freeport quadrangle: Hughes, H.H. 1
   McKeesport area: Ashley, G.H. 13
   New Kensington quadrangle: Richardson, G.B. 9
   Pittsburgh quadrangle: Johnson, M.E. 4, 9
   popular: Leighton, H. 3
   Sewickley quadrangle: Munn, M.J. 5
  Armstrong Co.
   Brookville quadrangle: Graeber, C.K. 3
   Clarion quadrangle: Shaw, E.W. 4
   Elders Ridge quadrangle: Stone, R.W. 3, 5
   Foxburg quadrangle: Shaw, E.W. 2
   Freeport quadrangle: Hughes, H.H. 1
   Kittanning quadrangle: Butts, C, 3, 4
   Rural Valley quadrangle: Butts, C. 5, 6
   Smicksburg quadrangle: Shaffner, M.N. 3
  Beaver Co.
   Beaver quadrangle: Woolsey, L.H. 3, 4
   Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
   New Castle quadrangle: De Wolf, F.W. 1
   Sewickley quadrangle: Munn, M.J. 5
   Zelienople quadrangle: Richardson, G.B. 12
  bibliography: Cathcart, S.H. 14; Peckham, S.F. 2
  Blair Co., Patton quadrangle: Campbell, M.R. 8
  Bradford Co.: Wells, H. 1
  Butler Co.
   Butler-Zelienople quadrangles: Richardson, G.B. 12
   Foxburg quadrangle: Shaw, E.W. 2, 4
   Hilliards quadrangle: Sherrill, R.E. 9
   Kittanning quadrangle: Butts, C. 3, 6
   New Kensington quadrangle: Richardson, G.B. 9
   Sewickley quadrangle: Munn, M.J. 5
  Cambria Co.: Platt, F. 4
   Barnesboro-Patton quadrangles: Campbell, M.R. 8
   Johnstown area: Fulton, J. 2
   Song Hollow area: Fulton, J. 2
  Cameron Co.: Cathcart, S.H. 10
  Clarion Co.
   Brookville quadrangle: Graeber, C.K. 3
   Clarion quadrangle: Shaw, E.W. 4

  Foxburg quadrangle: Shaw, E.W. 2, 4
  Kittanning quadrangle: Butts, C. 3, 6
  Oil City quadrangle: Dickey, P.A. 4, 5
  Rural Valley quadrangle: Butts, C. 5, 6
Clearfield Co.
  Barnesboro-Patton quadrangles: Campbell, M.R. 8
  Punxsutawney quadrangle: Ashley, G.H. 33
Clinton Co.: Fuller, M.L. 5; Johnson, M.E. 3
Crawford Co.
  Meadville area: Johnson, M.E. 2
  Titusville quadrangle: Dickey, P.A. 6
Elk Co.: Ashburner, C.A. 28; Cathcart, S.H. 9
Erie Co.: White, I.C. 9
  Corry area: Johnson, M.E. 2
Fayette Co.: Fettke, C.R. 23; Gibbs, H.S. 1; Hickok, W.O. 10
  Brownsville-Connellsville quadrangles: Campbell, M.R. 2
  Masontown quadrangle: Campbell, M.R. 1
  Waynesburg quadrangle: Stone, R.W. 4
Forest Co.
  Oil City quadrangle: Dickey, P.A. 4, 5
  Tidioute quadrangle: Cathcart, S.H. 13
  Titusville quadrangle: Dickey, P.A. 6
Greene Co.: Stone, R.W. 1, 8, 33
  Amity quadrangle: Clapp, F.G. 4, 6
  Claysville quadrangle: Griswold, W.T. 2; Munn, M.J. 7
  Masontown quadrangle: Campbell, M.R. 1
  Rogersville quadrangle: Clapp, F.G. 5
  Waynesburg quadrangle: Stone, R.W. 4
Indiana Co.
  Barnesboro quadrangle: Campbell, M.R. 8
  Elders Ridge quadrangle: Stone, R.W. 3, 5
  Indiana quadrangle: Richardson, G.B. 2
  Latrobe quadrangle: Campbell, M.R. 6
  Punxsutawney quadrangle: Ashley, G.H. 33
  Smicksburg quadrangle: Shaffner, M.N. 3
Jefferson Co.
  Brookville quadrangle: Graeber, C.K. 3
  Punxsutawney quadrangle: Ashley, G.H. 33
  Smicksburg quadrangle: Shaffner, M.N. 3
Lawrence Co.
  New Castle quadrangle: De Wolf, F.W. 1
  Zelienople quadrangle: Richardson, G.B. 12
McKean Co.: Ashburner, C.A. 14; Cathcart, S.H. 8
Northern: Fettke, C.R. 19; Robinson, J.F. 5; Torrey, P.D. 3
  Oriskany sandstone: Hamilton, S.H. 3
Northwestern: Fettke, C.R. 14; Newberry, J.S. 2; Torrey, P.D. 6
origin, relation to coal and oil: Ashley, G.H. 19
Potter Co.: Cathcart, S.H. 5; Reeves, J.R. 1
  East Fork-Wharton field: Ebright, J.R. 1
  Gaines quadrangle: Fuller, M.L. 4
Somerset Co.: Gibbs, H.S. 1
  Somerset quadrangle: Richardson, G.B. 11
Southeastern: Carter, O.C.S. 7
  lack of possibilities: Ashley, G.H. 14
Southwestern: Munn, M.J. 1; Pepper, J.F. 1
Tioga Co.: Ashley, G.H. 49; Cathcart, S.H. 2, 6; Gaddess, J. 1; Garrett S.G. 1; Lucke, J.B. 1; Torrey, P.D. 2
  Elkland-Tioga quadrangles: Fuller, M.L. 3
  Gaines quadrangle: Fuller, M.L. 4
Venango Co.: Evans, E.W. 1
  Foxburg quadrangle: Shaw, E.W. 2, 4
  Franklin quadrangle: Dickey, P.A. 5; Sherrill, R.E. 5
  Hilliards quadrangle: Sherrill, R.E. 9
  Oil City quadrangle: Dickey, P.A. 4, 5
  Titusville quadrangle: Dickey, P.A. 6
Warren Co.
  Tidioute quadrangle: Cathcart, S.H. 13
  Titusville quadrangle: Dickey, P.A. 6
  Warren quadrangle: Butts, C. 11
Washington Co.: Ingham, A.I. 2; Robinson, J.F. 3
  Amity quadrangle: Clapp, F.G. 4, 6
  Brownsville quadrangle: Campbell, M.R. 2
  Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
  Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3

    - Claysville quadrangle: Griswold, W.T. 2; Munn, M.J. 7
    - Masontown quadrangle: Campbell, M.R. 1
    - North Strabane area: Fettke, C.R. 29
    - Pittsburgh quadrangle: Johnson, M.E. 9
    - Rogersville quadrangle: Clapp, F.G. 5
    - Steubenville quadrangle: Griswold, W.T. 2
    - Waynesburg quadrangle: Stone, R.W. 4
- Western: Ashburner, C.A. 39; Ashley, G.H. 17, 28, 40, 76; Bownocker, J.A. 1, 2; Campbell, M.R. 5; Carll, J.F. 6, 7; Chance, H.M. 15; Clapp, F.G. 9, 11, 13; Finn, F.H. 1; Lesley, J.P. 52; Moyer, W.I. 1; Munn, M.J. 8; Postley, O.C. 1; Sisler, J.D. 28; White, I.C. 15
    - analyses: Hickok, W.O. 3; Phillips, F.C. 1
    - examples of occurrence: Ashburner, C.A. 37
    - geochemistry: Price, P.H. 5
    - reserves: Ashley, G.H. 27
    - Silurian-Devonian possibilities: Ashley, G.H. 22
    - well logs: Platt, F. 2
- Westmoreland Co.: Lesley, J.P. 34, 66; Robinson, J.F. 2
    - Connellsville quadrangle: Campbell, M.R. 2
    - Freeport quadrangle: Hughes, H.H. 1
    - Greensburg quadrangle: Johnson, M.E. 8
    - Latrobe quadrangle: Campbell, M.R. 6
    - New Kensington quadrangle: Richardson, G.B. 9
    - Pittsburgh quadrangle: Johnson, M.E. 9

NAUTILOIDEA, *see* Cephalopoda

NEOLITE
- Lebanon Co.: Eyerman, J. 1

NESQUEHONITE
- Schuylkill Co.: Genth, F.A. 27

NICKEL
- Lancaster Co.: Frazer, P. 29; Jonas, A.I. 6; Kemp, J.F. 6; Moyd, L.S. 1; Phemister, T.C. 1; Sampson, E. 1
    - popular: Foose, R.M. 10; Stone, R.W. 51
- Pennsylvania: Ashley, G.H. 76

NITRATE
- Westmoreland Co.: Mansfield, G.R. 1

NORTHAMPTON COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern
- bibliography: Miller, B.L. 35
- engineering geology, structure: Plank, W.B. 1
- gravity survey: Hersey, J.B. 1, 2
- magnetic survey: Ewing, W.M. 1; Hersey, J.B. 1
- seismic survey: Ewing, W.M. 2

Areal geology
- Allentown quadrangle: Miller, B.L. 14
- Chestnut Ridge: Dorrance, M.D. 1
- Delaware Valley: Smith, L.L. 1
- Delaware Water Gap quadrangle, Precambrian: Bayley, W.S. 2
- Easton area: Finch, J. 1
- Easton quadrangle, Precambrian: Bayley, W.S. 2
- Northampton Co.: Lesley, J.P. 42; Miller, B.L. 35

Economic geology
- abrasives: Miller, B.L. 28
- asbestos, Easton-Delaware Water Gap quadrangles: Bayley, W.S. 2
- building stone: Miller, B.L. 28
- cement: Eckel, E.C. 1, 4; Miller, B.L. 19, 28; Peck, F.B. 4, 7, 8
    - Allentown quadrangle: Miller, B.L. 14
- clay: Miller, B.L. 28
    - Allentown quadrangle: Miller, B.L. 14
    - Easton-Delaware Water Gap quadrangles: Bayley, W.S. 2
- coal, anthracite: Johnson, W.R. 1
- copper, Allentown quadrangle: Miller, B.L. 14
- graphite, Allentown quadrangle: Miller, B.L. 14
- iron: Miller, B.L. 28; Prime, F. 6
    - Allentown quadrangle: Miller, B.L. 14
    - Easton-Delaware Water Gap quadrangles: Bayley, W.S. 2
- limestone: Miller, B.L. 28
    - Allentown quadrangle: Miller, B.L. 14
- manganese: Woodhouse, J. 1
    - Allentown quadrangle: Miller, B.L. 14
- mica
    - Allentown quadrangle: Miller, B.L. 14
    - Easton-Delaware Water Gap quadrangles: Bayley, W.S. 2
- paint ore: Miller, B.L. 28
    - Allentown quadrangle: Miller, B.L. 14
    - Easton-Delaware Water Gap quadrangles: Bayley, W.S. 2

- peat: Miller, B.L. 28
  - Allentown quadrangle: Miller, B.L. 14
- sand and gravel: Miller, B.L. 28
  - Allentown quadrangle: Miller, B.L. 14
- serpentine: Peck, F.B. 1, 8
- slate: Behre, C.H. 1, 4, 8, 9, 10; Chance, H.M. 13; Dale, T.N. 2; Merriman, M. 1; Peck, F.B. 4; Sanders, R.H. 2
  - Allentown quadrangle: Miller, B.L. 14
- soapstone: Miller, B.L. 28
- stone
  - Allentown quadrangle: Miller, B.L. 14
  - Easton-Delaware Water Gap quadrangles: Bayley, W.S. 2
- talc: Peck, F.B. 1, 5, 8
  - Easton-Delaware Water Gap quadrangles: Bayley, W.S. 2
- zinc
  - Allentown quadrangle: Miller, B.L. 14
  - Easton-Delaware Water Gap quadrangles: Bayley, W.S. 2

Ground water
- Northampton Co.: Miller, B.L. 30

Historical geology
- Cambrian: Peck, F.B. 3
  - Hardyston Formation: Miller, B.L. 32; Myers, P.B. 1; Prime, F. 7
- Cambrian-Ordovician: Peck, F.B. 8; Prime, F. 2, 6
- Cambrian-Silurian: Behre, C.H. 4
- Cenozoic: Miler, B.L. 29, 39
- Mesozoic: Miller, B.L. 29, 39
- Ordovician
  - Allentown limestone: Peterson, R.G. 2
  - Jacksonburg limestone: Miller, R.L. 2, 4
  - Martinsburg Formation: Miller, B.L. 33
- Ordovician-Silurian: Willard, B. 2
- Paleozoic: Miller, B.L. 29, 39
- Precambrian: Fraser, D.M. 11, 12; Miller, B.L. 29
  - Easton-Delaware Water Gap quadrangles: Bayley, W.S. 2
  - Reading Prong: Peck, F.B. 8
- Precambrian-Pleistocene: Lesley, J.P. 42
  - Allentown quadrangle: Miller, B.L. 14
- Triassic: Willard, B. 65

Maps
- Economic
  - Allentown quadrangle, mineral resources: Miller, B.L. 14
  - cement: Miller, B.L. 19; Peck, F.B. 7
  - iron: Frazer, P. 20
  - slate: Behre, C.H. 4
- Geologic: Lesley, J.P. 42, 46, 47; Miller, B.L. 35; Peck, F.B. 8
  - Allentown quadrangle: Miller, B.L. 14
  - Bangor-Windgap area: Behre, C.H. 4, 9
  - cement district: Eckel, E.C. 2, 4
  - Danielsville-Lehigh River area: Behre, C.H. 9
  - Delaware Water Gap-Easton quadrangles, Precambrian: Bayley, W.S. 2
  - Reading Prong: Lesley, J.P. 42, 48
  - slate belt: Behre, C.H. 4, 9

Mineralogy
- allanite: Genth, F.A. 7
- amphibole: Eyerman, J. 6
- aragonite: Eyerman, J. 1
- autunite: Gehman, G.W. 1
- axinite: Frazier, B.W. 1
- beraunite: Wherry, E.T. 15
- biotite: Bauer, M. 1; Eyerman, J. 6; Grailich, J. 1; Knop, A. 1
- calamine: Eyerman, J. 1
- chalcopyrite: Eyerman, J. 5
- graphite: Eyerman, J. 5
- gypsum: Lewis, H.C. 21
- hydromagnesite: Eyerman, J. 5
- illite: Bates, T.F. 2
- jasper: Myers, P.B. 2
- lepidocrocite: Posnjak, E. 1
- malachite: Eyerman, J. 1
- mica: Rammelsburg, C.F. 2
- mineral list: Miller, B.L. 34
- mineral locations: Finch, J. 1
- orthoclase: Eyerman, J. 6
- prochlorite: Eyerman, J. 6
- pyrite: Gehman, G.W. 1
  - Allentown quadrangle: Miller, B.L. 14
- quartz: Eyerman, J. 1
- sericite, Reading Prong: Fraser, D.M. 5
- serpentine: Eyerman, J. 6; Smith, S. 1
- thorianite: Gehman, G.W. 1; Wells, R.C. 1
- thorogummite: Gehman, G.W. 1
- topaz: Eyerman, J. 5
- tourmaline: Eyerman, J. 6
- uraninite: Gehman, G.W. 1
- uranophane: Gehman, G.W. 1
- uranotile: Bertrand, J.H. 1
- wavellite: Wherry, E.T. 21
- wernerite: Gehman, G.W. 1
- zircon: Gehman, G.W. 1

Paleontology
- algae, Cambrian: Fenton, C.L. 1

worm, Cambrian: Howell, B.F. 4; Miller, B.L. 38

Petrology
andesite, metamorphosed, Ordovician: Fraser, D.M. 7
diabase, metamorphosed, Ordovician: Fraser, D.M. 7
dolomite, Allentown quadrangle: Salisbury, S.H. 1
igneous intrusions: Ludlum, J.C. 1
jasper, origin: Myers, P.B. 2
metamorphic rocks: Hall, C.E. 8
oolites, bi-colored: Wherry, E.T. 16
pegmatite, Reading Prong, Paleozoic: Fraser, D.M. 4
serpentine: Merrill, G.P. 4
slate, structural petrography: Behre, C.H. 7
southeastern
  igneous rocks, Paleozoic: Fraser, D.M. 12
  metamorphic rocks, Precambrian: Fraser, D.M. 12

Physical geology
fault, Camelhump area: Petersen, R.G. 1
folding, Taconic: Behre, C.H. 2
Reading overthrust: Miller, B.L. 51
shearing, Reading Prong: Fraser, D.M. 6
structure: Miller, B.L. 40
  Delaware water gap: Chance, H.M. 10
  Schuylkill gap: Chance, H.M. 13
  slate belt: Behre, C.H. 3

Physiography
caves: Willard, B. 52
  Raubsville area: Lyman, B.S. 10
Delaware water gap: Brodhead, L.W. 1; Mitchill, S.L. 1; Preston, S. 1; Stose, G.W. 14; Walter, E. 1
drainage changes
  Lehigh River: Lesley, J.P. 41
  Monocacy River: Borheck, H.T. 1
glacial geology: Hall, C.E. 1; Prime, F. 5; Rau, A.G. 1; Ward, F. 6, 7; Williams, E.H. 3, 13
  Delaware Valley: Ward, F. 3
  Lake Packer, Pleistocene: Williams, E.H. 3
  moraines, southern limit: Cook, G.H. 2
  Reading Prong: Barrell, J. 1; Williams, E.H. 2
kames: Lewis, H.C. 40; Miller, B.L. 39
  Delaware Valley: Ward, F. 7
Lehigh Gap: Mitchill, S.L. 1
Northampton Co.: Miller, B.L. 36
terraces, Delaware Valley: Ward, F. 7
wind and water gaps: Volney, C.F. 1; Willard, B. 52
Windgap area: Mackin, J.H. 5

NORTHUMBERLAND COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern

Areal geology
northern: White, I.C. 12

Economic geology
coal, anthracite: Rogers, H.D. 20
lead: Johnson, J.W. 1; Miller, B.L. 13
zinc: Miller, B.L. 13

Ground water
Northumberland Co.: Lohman, S.W. 1

Historical geology
Devonian: Willard, B. 11
  Tully limestone: Willard, B. 18
Pennsylvanian, Western Middle anthracite field: Ashburner, C.A. 18
Silurian-Mississippian: White, I.C. 12
Silurian-Pennsylvanian: Willard, B. 46

Maps
Geologic: Lesley, J.P. 46, 47; White, I.C. 12
  Western Middle anthracite field: Ashburner, C.A. 18

Mineralogy
dickite: Honess, A.P. 4

Paleontology
brachiopods, Devonian, Tully limestone: Willard, B. 26
nautiloids, Devonian: Miller, A.K. 2

Physical geology
structure, anthracite basins: Lyman, B.S. 8

OIL, *see* Petroleum

OIL AND GAS FIELDS, *see also* Natural gas, and Petroleum
Bradford field, McKean Co.: Ashburner, C.A. 9; Fettke, C.R. 16, 20; Newby, J.B. 1
Butler-Clarion Co. oil fields: Carll, J.F. 5
Corry area, Erie Co.: Johnson, M.E. 2
Dunkard Creek field, Greene Co.: Carll, J.F. 5
East Fork-Wharton fields, Potter Co.: Ebright, J.R. 1
Farmington field, Tioga Co.: Torrey, P.D. 3
Gaines oil field, Tioga Co.: Cathcart, S.H. 6; Fuller, M.L. 2
Hebron field, Potter Co.: Cathcart, S.H. 4; Reeves, J.R. 1
Hopper field, Allegheny Co.: Ingham, A.I. 2
Hyner gas field, Clinton Co.: Fuller, M.L. 5
Little Washington field, Washington Co.: Carll, J.F. 5

McCurdy field, Allegheny Co.: Ingham, A.I. 2
McDonald oil field, Washington-Allegheny Cos.: Ingham, A.I. 2, 3
McKean Co. fields: Ashburner, C.A. 14
McKeesport gas field, Allegheny Co.: Ashley, G.H. 13, 21; Moyer, W.I. 1
Meadville area, Crawford Co.: Johnson, M.E. 2
Moon Run-Crafton field, Allegheny Co.: Ingham, A.I. 2
Music Mtn. field, McKean Co.: Fettke, C.R. 24, 25
Northern, Oriskany fields: Fettke, C.R. 19
Pollock Run gas field, Westmoreland Co.: Robinson, J.F. 2
Scenery Hill gas field, Washington Co.: Robinson, J.F. 3
Sherry Hill gas field, Washington Co.: Robinson, J.F. 3
Southwestern: Pepper, J.F. 1
Summit gas field, Fayette Co.: Fettke, C.R. 23
Thorn Creek field, Butler Co.: Carll, J.F. 5
Tidioute field, Warren Co.: Johnson, M.E. 2, 7
Tioga gas field, Tioga Co.: Cathcart, S.H. 6; Robinson, J.F. 6
Venice field, Washington Co.: Ingham, A.I. 2
Western: Arnold, R. 1; Ashley, G.H. 29; Carll, J.F. 7; Clapp, F.G. 13; Ver Wiebe, W.A. 6

OIL SHALE
Pennsylvania: Ashley, G.H. 11; Fettke, C.R. 3, 5

OOLITES
Adams Co., deformation: Cloos, E. 6
Central, siliceous: Krynine, P.D. 8
Centre Co., siliceous: Barbour, E.H. 1; Brown, T.C. 1, 3; Hovey, E.O. 1; Moore, E.S. 1; Wieland, G.R. 1, 2; Ziegler, V. 1
Cumberland-Franklin Cos., deformation: Cloos, E. 6
Franklin Co., deformation: Cloos, E. 2
Northampton Co.
  Allentown limestone: Petersen, R.G. 2
  bi-colored: Wherry, E.T. 16

OPAL
(hyalite), Philadelphia Co.: Lewis, H.C. 19

ORDOVICIAN, *see also* Paleozoic
Adams Co.: Frazer, P. 13; Hickok, W.O. 8; Keith, A. 1; Stose, G.W. 21
  Fairfield - Gettysburg quadrangles: Stose, G.W. 27
  Hanover quadrangle: Stose, A.I.J. 1
Bedford Co.: Stevenson, J.J. 8
  Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  Pawpaw quadrangle: Stose, G.W. 12
Berks Co.: D'Invilliers, E.V. 1; Leidy, J. 14; Lesley, J.P. 42; Miller, B.L. 31; Willard, B. 47
  andesite dikes: Russell, G.C. 1
  Oley Valley: Bertelet, P.G. 1
  South Mtn. area: Eaton, H.N. 1
Blair Co.: Butts, C. 13; Krynine, P.D. 10; Platt, F. 6, 15
  Hollidaysburg quadrangle: Butts, C. 20
  Tyrone quadrangle: Butts, C. 18
Bradford Co.: Torrey, P.D. 3
Bucks Co.: Hall, C.E. 7
  Allentown quadrangle: Miller, B.L. 14
  Doylestown-Quakertown quadrangles: Bascom, F. 17
  Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  Trenton quadrangle: Bascom, F. 10
Carbon Co.: Ashburner, C.A. 24
Central: Craig, L.C. 1; Field, R.M. 2, 3; Kay, G.M. 5; Krynine, P.D. 7; Prouty, C.E. 2; Rogers, H.D. 4; Swartz, F.M. 20; Ulrich, E.O. 3
  bentonite: Bonine, C.A. 2; Rosenkrans, R.R. 1; Whitcomb, L. 2
  Harrisburg axis: Willard, B. 57
  limestone, sedimentary structures: Field, R.M. 1
Centre Co.: Brown, T.C. 1; Collie, G.L. 1; D'Invilliers, E.V. 4; Ewing, A.L. 1; Kay, G.M. 4; Krynine, P.D. 5, 10; Larson, E.R. 1; Taylor, R.C. 1
  Bellefonte quadrangle: Butts, C. 16
  bentonite: Ross, C.S. 1
  Blount group: Butts, C. 15
  shell conglomerate: Eaton, H.N. 3
  Tyrone quadrangle: Butts, C. 18
Chester Co.: Abbey, M.B. 1; Hartman, M.D. 1; Hawkins, A.C. 2; Jonas, A.I. 2; Lesley, J.P. 41; Stose, G.W. 18
  Coatesville-West Chester quadrangles: Bascom, F. 18
  Conestoga limestone: Jonas, A.I. 14
  Doe Run-Avondale area: Bliss, E.F. 2
  Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  Norristown quadrangle: Bascom, F. 9
  Octoraro phyllite: Boudreau, E. 1
  Quarryville quadrangle: Jonas, A.I. 6; Knopf, E.F.B. 4

Clinton Co.: Chance, H.M. 1, 7; Kay, G.M. 4; Ulmer, L.J. 1
  Trenton limestone: Whitcomb, L. 3
Cumberland Co.: Hickok, W.O. 8
  Fairfield quadrangle: Stose, G.W. 27
Dauphin Co.: Willard, B. 67
  Martinsburg shale: Secrist, M.H. 1; Gorman, J.P. 1; Laird, W.M. 1
  Middletown quadrangle: Stose, G.W. 33
Delaware Co.: Hall, C.E. 9
  Radnor area: Rand, T.D. 16
  serpentine: Rand, T.D. 12
  West Chester quadrangle: Bascom, F. 18
Eastern
  bentonite: Rosenkrans, R.R. 3
  Martinsburg limestone: Miller, R.L. 1
Erie Co.: Torrey, P.D. 3
Franklin Co.: Keith, A. 1; Stose, G.W. 6
  bentonite: Whitcomb, L. 5
  Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
  Fairfield quadrangle: Stose, G.W. 27
  Hancock quadrangle: Stose, G.W. 12
Fulton Co.: Stevenson, J.J. 8
  Hancock-Pawpaw quadrangles: Stose, G.W. 12
  Mercersburg quadrangle: Stose, G.W. 10
Huntingdon Co.: Ashburner, C.A. 3, 4, 6; Butts, C. 13; Grant, A.M. 1; White, I.C. 14
  Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
Juniata Co.: D'Invilliers, E.V. 10
Lancaster Co.: Abbey, M.B. 1; Cloos, E. 8; Frazer, P. 23, 29; Lesley, J.P. 36; Platt, F. 16; Stose, G.W. 18
  Coatesville quadrangle: Bascom, F. 18
  Conestoga limestone: Jonas, A.I. 14
  Honeybrook quadrangle: Bascom, F. 21
  Lancaster quadrangle: Jonas, A.I. 10
  McCalls Ferry quadrangle: Jonas, A.I. 5; Knopf, E.F.B. 4
  Middletown quadrangle: Stose, G.W. 33
  New Holland quadrangle: Jonas, A.I. 7
  Peach Bottom slate: Frazer, P. 28, 35
  Quarryville quadrangle: Jonas, A.I. 6; Knopf, E.F.B. 4
  South Mtn. area: Eaton, H.N. 1
  southern: Cloos, E. 3
Lebanon Co.
  Middletown quadrangle: Stose, G.W. 33
  South Mtn. area: Eaton, H.N. 1
Lehigh Co.: Lesley, J.P. 42; Miller, B.L. 31; Miller, R.L. 2; Peck, F.B. 8; Prime, F. 2
  Allentown quadrangle: Miller, B.L. 14
  Martinsburg Formation: Willard, B. 56
  Quakertown quadrangle: Bascom, F. 17
  rhythms: Barrell, J. 7
McKean Co.: Torrey, P.D. 3
Mifflin Co.: D'Invilliers, E.V. 10
Monroe Co.: Willard, B. 40
Montgomery Co.: Frazer, P. 36; Hall, C.E. 7; Rand, T.D. 17
  Germantown-Norristown quadrangles: Bascom, F. 9
  Quakertown quadrangle: Bascom, F. 17
Northampton Co.: Behre, C.H. 4; Lesley, J.P. 42; Miller, B.L. 31; Peck, F.B. 8; Prime, F. 2; Willard, B. 2
  Allentown limestone: Petersen, R.G. 2
  Allentown quadrangle: Miller, B.L. 14
  Jacksonburg Formation: Miller, R.L. 4, 5
  Martinsburg Formation: Miller, B.L. 33
Northeastern, anthracite region: Ashburner, C.A. 21
Northern: Cathcart, S.H. 11; Swartz, F.M. 23; Taylor, R.C. 5; Torrey, P.D. 3
Northwestern: Fettke, C.R. 12, 13, 30
Pennsylvania: Ashley, G.H. 41; Bassler, R.S. 3; Conrad, T.A. 3; Eaton, A. 2; Grabau, A.W. 6, 7, 15; Hopkins, T.C. 3; Hunt, T.S. 3; Kay, G.M. 1, 3; Lesley, J.P. 67; Murdy, R.J. 1; Prouty, C.E. 1; Rogers, H.D. 2; Schuchert, C. 3, 11, 23; Swartz, F.M. 22; Ulrich, E.O. 1, 5; Ver Wiebe, W.A. 7; Vicaire, A. 1; Willard, B. 51; Willis, B. 8; Winchell, A. 1
  bentonite: Rosenkrans, R.R. 2, 3; Whitcomb, L. 7
  clastics: Willard, B. 60
  continental deposits: Willard, B. 55
  delta deposits: Grabau, A.W. 11
  limestone: Miller, B.L. 18
  symposium: Galey, J.T. 1
Perry Co.: Claypole, E.W. 16; Willard, B. 33

Philadelphia Co.: Hall, C.E. 7
  Germantown quadrangle: Bascom, F. 9
  Trenton quadrangle: Bascom, F. 10
Potter Co.: Torrey, P.D. 3
Schuylkill Co.: Sheafer, P.W. 1
Snyder Co.: D'Invilliers, E.V. 10
Southcentral: Aiken, W.E.A. 1
  Blount group: Butts, C. 15
Southeastern: Bascom, F. 8; Buie, B.F. 1; Foerste, A.F. 1; Frazer, P. 31; Hall, C.E. 6; Hawkins, A.C. 2; Hunt, T.S. 11; Miller, B.L. 17, 22, 23; Rand, T.D. 27; Rogers, H.D. 3, 4, 5; Stose, G.W. 9, 18; Swartz, F.M. 21; Ulrich, E.O. 3; Walcott, C.D. 1, 8; Watson, E.H. 2; Wherry, E.T. 5; Willard, B. 3, 44
  Conestoga limestone: Stose, G.W. 19
  Glenarm series: Knopf, E.F.B. 2; Mackin, J.H. 3
  Harrisburg axis: Willard, B. 57
  Martinsburg Formation: Behre, C.H. 6; Frazer, P. 18; Hintze, F.F. 1
  overlap: Stose, G.W. 19
  Piedmont area: Bascom, F. 8; Mathews, E.B. 1
  shale: Stose, G.W. 16, 24; Willard, B. 50
  Taconic sequence: Stose, G.W. 44
Southwestern: Butts, C. 8; Lafferty, R.C. 1; Rogers, H.D. 4
Susquehanna Co.: Torrey, P.D. 3
Tioga Co.: Torrey, P.D. 3
Union Co.: D'Invilliers, E.V. 10
Warren Co.: Torrey, P.D. 3
Wayne Co.: Torrey, P.D. 3
Western: Bownocker, J.A. 1; Fettke, C.R. 22, 26; Kay, G.M. 6; Martens, J.H. 1, 2; Rittenhouse, G. 6; Ver Wiebe, W.A. 5
Wyoming Co., popular: Maxwell, V.L. 1
York Co.: Demming, H.C. 1; Frazer, P. 13, 37; Hickok, W.O. 8; Mathews, E.B. 1; Stose, G.W. 18, 39
  Hanover-York area: Jonas, A.I.J. 1
  McCalls Ferry quadrangle: Jonas, A.I. 5; Knopf, E.F.B. 4
  Middletown quadrangle: Stose, G.W. 33
  Peach Bottom slate: Frazer, P. 28, 35

ORTHOCLASE, *see* Feldspar

OSTRACODA, *see also* Arthropoda, and Crustacea
Carbon Co., Devonian: Willard, B. 43
Central
  Devonian: Swartz, F.M. 3, 8, 9, 12
  Silurian: Swartz, F.M. 4
Centre Co., Ordovician: Collie, G.L. 1; Jones, T.R. 1
Chester Co., Triassic: Leidy, J. 5; Wheatley, C.M. 1
Greene Co., Permian: Holland, W.C. 1; Scott, H.W. 1
Huntingdon Co.
  Ordovician: Jones, T.R. 1
  Silurian: Jones, T.R. 1; Ulrich, E.O. 7
Juniata Co., Silurian: Ulrich, E.O. 7
Pennsylvania
  Devonian: Jones, T.R. 1; Swartz, F.M. 16
  Ordovician-Silurian: Jones, T.R. 2
  Paleozoic: Ulrich, E.O. 2
  zones: Cooper, C.L. 1
  Silurian: Jones, T.R. 2
Perry Co., Silurian-Devonian: Jones, T.R. 3
York Co., Triassic: Wanner, H.E. 1

OZARKIAN
Central-Southeastern: Ulrich, E.O. 3

PAINT ORE
Berks Co.: Stoddard, J.C. 1
Bucks Co.
  Allentown quadrangle: Miller, B.L. 14
  Easton quadrangle: Bayley, W.S. 2
  Triassic: Lyman, B.S. 7
Carbon Co.: Agthe, F.T. 1; Eckel, E.C. 3; Hesse, C.E. 1; Hill, F.A. 4
Lancaster Co.: Landis, D.B. 1
Lehigh Co.: Miller, B.L. 44; Stoddard, J.C. 1
  Allentown quadrangle: Miller, B.L. 14
  Quakertown quadrangle: Bascom, F. 17
McKean Co.: Ashburner, C.A. 14
Northampton Co.: Miller, B. 28
  Allentown quadrangle: Miller, B.L. 14
  Delaware water gap-Easton quadrangles: Bayley, W.S. 2
Pennsylvania: Miller, B.L. 1, 2
Perry Co.: Claypole, E.W. 16

PAINTERITE, *see* Vermiculite

PALEOCLIMATOLOGY
Pennsylvania, Devonian-Permian: White, C.D. 11
Southwestern: Case, E.C. 3

PALEOBOTANY, *see also* Algae, Bacteria, Diatoms, and Fucoids
Allegheny Co., Pennsylvanian: Grier, N.M. 1, 2
  Calamites: Gresley, W.S. 2
  Conemaugh Formation: Darrah, W.C. 1
  Pittsburgh area, popular: Leighton, H. 3

Beaver Co., Pennsylvanian: King, A.T. 4
  Cordaites fruit: Lesquereux, L. 14
  fungus: Lesquereux, L. 12
bibliography: Ward, L.F. 1
Blair Co., Pennsylvanian: White, C.D. 4
Bucks Co., Triassic: Wherry, E.T. 20
  conifer: Wherry, E.T. 29
  Stockton Formation: Brown, A.P. 4
Cambria Co., Pennsylvanian: Harlan, R. 3
Carbon Co., Pennsylvanian: Brongniart, A. 1; Göppert, J.H.R. 1; White, C.D. 3
Chester Co., Triassic: Lea, I. 10; Leidy, J. 5
  Brunswick shale: Lewis, H.C. 35
Dauphin Co., Pennsylvanian: Leidy, J. 8; Taylor, R.C. 9; White, I.C. 3
Greene Co., Permian: Darrah, W.C. 4
Lackawanna Co., Pennsylvanian: Davis, R.N. 1; Eaton, A. 4; Teschemacher, J.E. 2
Luzerne Co., Pennsylvanian, *Calamites:* Gresley, W.S. 2
McKean Co.
  Devonian, Chemung group: Arnold, C.A. 4
  Mississippian, Pocono sandstone: Arnold, C.A. 1, 2, 3
Montgomery Co., Triassic, tree: Carter, O.C.S. 8; Lyman, B.S. 12
Northeastern, Devonian, Marcellus-Portage Formations: Arnold, C.A. 10
Northern, Devonian, Catskill Formation: Arnold, C.A. 9
Paleozoic flora: Lesquereux, L. 16
Pennsylvania
  Devonian: Arnold, C.A. 6, 7; Dawson, J.W. 1
    Catskill Formation: Prosser, C.S. 1
  Mississippian: Arnold, C.A. 6; White, C.D. 12
    Mauch Chunk shale: Barrell, J. 3
  Pennsylvanian: Darrah, W.C. 6; Gresley, W.S. 8; Jongmans, W.J. 2, 6; Lesquereux, L. 1, 2, 3; White, C.D. 14; Wood, H.C. 1, 2, 3
    conifers: Teschemacher, J.E. 3
    Cordaites: Lesquereux, L. 13
    flora: Hitchcock, C.H. 1; Lesquereux, L. 4, 6, 15
    zones: Jongmans, W.J. 3; Read, C.B. 2
  Pennsylvanian-Permian flora: Lesquereux, L. 5, 11
Perry Co., Devonian: Harlan, R. 3; Taylor, R.C. 7
Philadelphia Co., Quaternary, tree: Richards, H.G. 1
preservation examples: Lesquereux, L. 10
Schuylkill Co.
  Mississippian: Arnold, C.A. 8; Jongmans, W.J. 4, 5
  Pennsylvanian: Harlan, R. 2; Jongmans, W.J. 5; White, C.D. 3; Unger, C.W. 1
  Silurian, coaly plants: Willard, B. 42
Southeastern
  Triassic: Ward, L.F. 2
    flora: Lyman, B.S. 6; Ward, L.F. 3
    wood: Wherry, E.T. 11
Southwestern, Permian: Fontaine, W.M. 1; Lesquereux, L. 6; White, C.D. 9
Susquehanna Co., Devonian, Chemung Formation: Penhallow, D.P. 1
Tioga Co., Pennsylvanian: Teschemacher, J.E. 1
Warren Co., Devonian: Newberry, J.S. 6
Washington Co.
  Pennsylvanian: Darrah, W.C. 6
  Permian: Darrah, W.C. 4
Western, Pennsylvanian: Kimball, J.P. 1
Westmoreland Co., Pennsylvanian: King, A.T. 5
Wyoming Co.
  Devonian, Catskill Formation: Arnold, C.A. 5; Dawson, J.W. 2, 3
  Pennsylvanian: Read, C.B. 1
York Co., Triassic flora: Wanner, A. 3

PALEONTOLOGY, by periods, *see also* individual types of fossils, tracks and trails
  Centre Co., Ordovician, shell-formed conglomerate: Eaton, H.N. 3
  faunal lists: Lesley, J.P. 67
  fossil collecting localities: Simpson, G.B. 1
  Perry Co.: Claypole, E.W. 23
  popular: Willard, B. 32

Cambrian
  algae
    Berks-Bucks Cos.: Fenton, C.L. 1
    Centre-Northampton Cos.: Fenton, C.L. 1
  brachiopods
    Cumberland-Franklin Cos.: Walcott, C.D. 9
    Lancaster-York Cos.: Walcott, C.D. 9
    Pennsylvania: Hitchcock, C.H. 2
  Bucks Co., fauna: Howell, B.F. 3
  Chester Co., fossil?: Cardeza, J.M. 1
  hydrozoan, Lancaster Co.: Ruedemann, R. 1
  Lancaster Co., fauna: Resser, C.E. 3

Pennsylvania: Rogers, H.D. 24
  catalog: Lesley, J.P. 57
plant, Berks-Lancaster Cos.: Haldeman, S.S. 1
Southeastern, fauna: Walcott, C.D. 2
Southern, fauna: Resser, C.E. 2
trilobites
  Central: Wilson, J.L. 2
  Lancaster Co.: Dunbar, C.O. 1
  York Co.: Wanner, A. 4
worms
  Berks Co.: Haldeman, S.S. 1; Howell, B.F. 2
  Franklin Co.: Cloud, P.E. 1
  Lancaster Co.: Haldeman, S.S. 1; Ruedemann, R. 3
  Lehigh Co., Hardyston quartzite: Miller, B.L. 38
  Northampton Co.: Howell, B.F. 4; Miller, B.L. 38
  Pennsylvania: Hitchcock, C.H. 2
  Southeastern: James, J.F. 1
York Co., fauna: Jandorf, M.L. 1; Resser, C.E. 3

Devonian
ammonoids
  Bedford-Clinton Cos.: Miller, A.K. 2
  Erie Co.: Miller, A.K. 1
  Lycoming Co.: Miller, A.K. 2
  Northwestern: Flower, R.H. 1
  Pennsylvania: Miller, A.K. 3
amphibians
  Northwestern: Caster, K.E. 1
  Susquehanna Co.: Anon. 30; Willard, B. 22
  Warren Co.: Marsh, O.C. 1
arthropods, Northwestern: Caster, K.E. 1
Blair Co., fauna: Kindle, E.M. 1
brachiopods
  Carbon-Erie Cos.: Simpson, G.B. 2
  McKean-Tioga Cos.: Simpson, G.B. 2
  Monroe Co.: Willard, B. 34
  Northumberland Co.: Willard, B. 26
  Northwestern: Caster, K.E. 1; Girty, G.H. 4
  Pennsylvania: Bye, D.L. 1
  Perry Co.: Claypole, E.W. 8; Rafinesque, C.S. 1
  Warren Co.: Simpson, G.B. 2
Bradford Co.: Wililams, H.S. 2
  fossil localities: Willard, B. 9
branchiopods, Perry Co., Moscow shale: Cleaves, A.B. 1
Bryozoa, Northern: McNair, A.H. 1
Carbon Co., Onondaga paint ore: Willard, B. 43
Central
  Hamilton fauna: Claypole, E.W. 25
  Helderberg fauna: Reeside, J.B. 1; Swartz, F.M. 1
  Onondaga fauna: Swain, F.M. 1
cephalopods, Northwestern: Caster, K.E. 1
Columbia Co., fossil localities: Willard, B. 9
conulariids
  Central: Richardson, E.S. 1
  Pennsylvania: Swartz, F.M. 14
coral reefs
  Carbon-Dauphin Cos.: Willard, B. 30
  Lebanon-Monroe Cos.: Willard, B. 30
  Perry-Pike Cos.: Willard, B. 30
  Schuylkill Co.: Willard, B. 30
corals, Huntingdon Co.: Simpson, G.B. 2
Crawford Co., fauna: Millward, W. 1; Prosser, C.S. 4
crinoids
  Carbon Co.: Goldring, W. 2
  Warren Co.: Goldring, W. 1
crustaceans
  Susquehanna Co., Chemung group: Caster, K.E. 9
  Wyoming Co., Catskill sandstone: Claypole, E.W. 7
Dauphin Co., fossil localities: Willard, B. 9
Eastern, Onondaga limestone fauna: Kindle, E.M. 3
echinoid, Warren Co., Waverly group: Cooper, G.A. 1
eurypterids
  McKean Co., Chemung group: Ehlers, G.M. 1
  Potter Co.: Willard, B. 12
  Venango Co., Chemung Formation: Hall, J. 6
  Warren Co.: Hall, J. 6, 7
fish
  Bradford Co.: Chadwick, G.H. 1; Claypole, E.W. 2; Cope, E.D. 8
  Columbia Co.: Leidy, J. 2
  Lackawanna-Luzerne Cos.: Cope, E.D. 12
  Northwestern: Caster, K.E. 1
  Susquehanna Co., Chemung Formation: Claypole, E.W. 1
  Tioga Co.: Claypole, E.W. 17; Cope, E.D. 12; Gregory, W.K. 2; Hall, J. 1; Leidy, J. 2, 3
    Catskill Formation: Conrad, T.A. 2; Cope, E.D. 8
  Wyoming Co.: Newberry, J.S. 4
gastropods
  Northwestern: Caster, K.E. 1
  Warren Co.: Simpson, G.B. 2
Luzerne Co., in drift: Corss, F. 2
Lycoming Co., fossil localities: Willard, B. 9
McKean Co., fossil localities: Willard, B. 9

Monroe Co.: Prosser, C.S. 2
  fossil localities: Willard, B. 9
  Marcellus fauna: Willard, B. 7
Montour Co., fossil localities: Willard, B. 9
nautiloids
  Bradford Co.: Flower, R.H. 2, 3
  Centre-Northumberland Cos.: Miller, A.K. 2
  Monroe Co.: Van Tuyl, F.M. 1
  Northwestern: Flower, R.H. 1
Northern: Williams, H.S. 9
Northumberland Co.: Willard, B. 18
  fossil localities: Willard, B. 9
ostracodes
  Central: Swartz, F.M. 3, 8, 9, 12
  Pennsylvania: Jones, T.R. 1; Swartz, F.M. 16
  Perry Co.: Jones, T.R. 3
pelecypods
  Huntingdon Co.: Simpson, G.B. 2
  Northwestern: Caster, K.E. 1, 10
  Warren Co.: Beecher, C.E. 2; Simpson, G.B. 2
Pennsylvania: Nelson, L.A. 1; Rogers, H.D. 24
  fauna: Chadwick, G.H. 6; Clarke, J.M. 3; Claypole, E.W. 27; Grabau, A.W. 1; Willard, B. 8
  faunal controls: Williams, H.S. 8
  flora: Dawson, J.W. 1; White, C.D. 10
  Onondaga fauna: Weller, S. 3
  Tully limestone fauna: Willard, B. 39
Perry Co.
  Catskill fauna: Claypole, E.W. 6
  fossil localities: Willard, B. 9
phyllocarids, Warren Co., Chemung-Waverly groups: Beecher, C.E. 6
phyllopods, Warren Co.: Beecher, C.E. 1
Pike Co.
  fossil localities: Willard, B. 9
  Hamilton fauna: Heilprin, A. 2
plants
  McKean Co., Chemung group, seeds: Arnold, C.A. 4
  Northeastern, Marcellus-Portage groups: Arnold, C.A. 10
  Northern, Catskill Formation: Arnold, C.A. 9
  Pennsylvania: Arnold, C.A. 6, 7
  Perry Co.: Harlan, R. 3; Taylor, R.C. 7
  Susquehanna Co., Chemung group: Penhallow, D.P. 1
  Warren Co.: Newberry, J.S. 6
  Wyoming Co., Catskill Formation: Arnold, C.A. 5; Dawson, J.W. 2, 3
Potter Co., fossil localities: Willard, B. 9
pteropod, Erie Co.: Williams, H.S. 3
reptile, Schuylkill Co.: Lea, I. 4
Southwestern: Stevenson, J.J. 5; Willard, B. 14
sponges
  Erie Co., Chemung Formation: Clarke, J.M. 6
  Northwestern: Caster, K.E. 1
  Perry Co.: Howell, B.F. 8
  Tioga Co.: Hall, J. 9
  Western: Caster, K.E. 11
Susquehanna Co., fossil localities: Willard, B. 9
Tioga Co., fossil localities: Willard, B. 9
trilobites
  Huntingdon Co.: Green, J. 1, 2, 3
  Monroe Co., Stormville shale: Heilprin, A. 1
  Northwestern: Caster, K.E. 1
  Pennsylvania: Swartz, F.M. 15
Union Co., fossil localities: Willard, B. 9
worms, Huntingdon Co.: Vokes, H.E. 1
xiphosurans
  McKean Co.: Eller, E.R. 2
  Warren Co.: Beecher, C.E. 5; Eller, E.R. 1

Mississippian
brachiopods
  Fayette Co., Greenbrier limestone: Benson, F.M. 1
  Huntingdon Co., Pocono Formation: Girty, G.H. 3
  Northwestern: Caster, K.E. 1; Girty, G.H. 4
cephalopods, Northwestern: Caster, K.E. 1
Crawford Co. fauna: Prosser, C.S. 4
crinoid, Huntingdon Co., Pocono Formation: Girty, G.H. 3
Dauphin Co. flora: Willard, B. 9
echinoids, Warren Co., Waverly group: Cooper, G.A. 1
eurypterid, Venango Co.: Hall, J. 7
fish
  Crawford Co.: Eastman, C.R. 1
  Northwestern: Caster, K.E. 1
gastropods
  Huntingdon Co., Pocono Formation: Girty, G.H. 3
  Northwestern: Caster, K.E. 1
mammal, Somerset Co.: Featherstonhaugh, G.W. 1
nautiloids
  Fayette Co.: Miller, A.K. 4
  Huntingdon Co., Pocono Formation: Girty, G.H. 3
pelecypods
  Huntingdon Co., Pocono Formation: Girty, G.H. 3
  Northwestern: Caster, K.E. 1

- Pennsylvania: Rogers, H.D. 24
  - fauna: Weller, S. 1
  - flora: White, C.D. 10
  - Catskill Formation: Prosser, C.S. 1
- plants
  - McKean Co., Pocono sandstone: Arnold, C.A. 1, 2, 3
  - Pennsylvania: Arnold, C.A. 6; White, C.D. 12
    - Mauch Chunk shale: Barrell, J. 3
  - Schuylkill Co.: Jongmans, W.J. 4
    - seeds: Arnold, C.A. 8
- reptiles
  - Northeastern: Rogers, H.D. 19
  - Schuylkill Co., Mauch Chunk Formation: Lea, I. 3
- Southwestern, fauna: Stevenson, J.J. 5
- sponges
  - Northwestern: Caster, K.E. 1
  - Western: Caster, K.E. 11
- starfish, Venango Co.: Berry, C.T. 1

Ordovician

- algae, Lancaster-York Cos., Peach Bottom slate: Frazer, P. 35
- brachiopods
  - Clinton Co.: Cooper, G.A. 2
  - Dauphin Co.: Secrist, M.H. 1
- Centre Co., fauna: Collie, G.L. 1
- cephalopods
  - Central: Richardson, E.S. 1
  - Cumberland Co.: Foerste, A.F. 2
- conulariids, Central: Richardson, E.S. 1
- crustaceans
  - Franklin Co.: Ruedemann, R. 2
  - Lehigh Co.: Ruedemann, R. 4
- Dauphin Co., Martinsburg shale: Secrist, M.H. 1
- fucoid, York Co.: Lesley, J.P. 32
- gastropods, Centre Co.: Collie, G.L. 1
- graptolites
  - Eastern: Ruedemann, R. 5
  - Southeastern: Moore, R.C. 1
  - York Co.: Hall, C.E. 6
- ostracodes
  - Centre Co.: Collie, G.L. 1; Jones, T.R. 1
  - Pennsylvania: Jones, T.R. 2
- Pennsylvania: Rogers, H.D. 24
  - catalog: Lesley, J.P. 57
  - fauna lists: Bassler R.S. 2
- Southeastern, Martinsburg shale: Stose, G.W. 29
- starfish, Cumberland Co.: Willard, B. 38
- trilobites
  - Bedford Co.: Haldeman, S.S. 2
  - Blair Co.: Raymond, P.E. 6
  - Centre Co.: Collie, G.L. 1; Raymond, P.E. 5
  - Clinton Co.: Whitcomb, L. 1
  - Cumberland Co.: Raymond, P.E. 8
  - Dauphin Co.: Secrist, M.H. 1
  - Franklin Co.: Howell, B.F. 7
  - Huntingdon Co.: Simpson, G.B. 2

Paleozoic

- Bryozoa, Pennsylvania: Bassler, R.S. 1
- crustaceans, Pennsylvania: Vodges, A.W. 2
- fish, Pennsylvania: Newberry, J.S. 8
- ostracodes, Pennsylvania: Ulrich, E.O. 2
  - zones: Cooper, C.L. 1
- Pennsylvania: Lesley, J.P. 67
- trilobites, Pennsylvania: Vodges, A.W. 2

Pennsylvanian

- Allegheny Co.
  - Ames limestone: Theiss, M.E. 1
  - fauna: Seaman, D.M. 1
  - popular: Leighton, H. 3
- amphibians
  - Allegheny Co.: Case, E.C. 1; Darrah, W.C. 1; Moodie, R.L. 3; Romer, A.S. 2
  - Beaver Co.: Cope, E.D. 12; Moodie, R.L. 3
  - Dauphin Co.: Leidy, J. 8
  - Pennsylvania: Moodie, R.L. 1, 2; Raymond, P.E. 2
  - Schuylkill Co.: Leidy, J. 12
- amphibian tracks, Westmoreland Co.: King, A.T. 3
- arthropods, Luzerne Co.: Packard, A.S. 1
- bacteria, Schuylkill Co.: Turner, H.G. 3
- Beaver Co.: Lesquereux, L. 14
- Bedford Co.: Gardner, J.H. 1
- birds, Westmoreland Co.: King, A.T. 1; Lyell, C. 3
- brachiopods, Cambria Co.: Conrad, T.A. 1
- cephalopods, Western: Miller, A.K. 5
- cockroaches, Jefferson-Mercer Cos.: Cockerell, T.D.A. 1
- crinoid, Allegheny Co., Ames limestone: Burke, J.J. 1
- eurypterids
  - Beaver Co.: Hall, C.E. 3; Hall, J. 6; Mansfield, I.F. 1, 3
  - Pennsylvania: Clarke, J.M. 4
  - Venango Co., post-Garland conglomerate: Hall, C.E. 3
- fish
  - Beaver Co.: Westoll, T.S. 1
  - Blair Co.: Leidy, J. 2
  - Dauphin Co.: Leidy, J. 8
  - Luzerne Co.: Lea, I. 8
  - Western: Leidy, J. 1
- Fulton Co.: Gardner, J.H. 1

fungus, Beaver Co., Darlington shale: Lesquereux, L. 12
gastropods
  Cambria Co.: Conrad, T.A. 1
  Luzerne Co.: Claypole, E.W. 20
Huntingdon Co.: Gardner, J.H. 1
insects
  Allegheny Co.: Carpenter, F.M. 1
  Beaver Co.: Scudder, S.H. 3, 4, 7
  Jefferson Co.: Carpenter, F.M. 1
  Luzerne Co.: Lacoe, R.D. 2; Scudder, S.H. 1, 3, 4, 5, 6, 7; Willard, B. 59
  Pennsylvania: Scudder, S.H. 2
  Schuylkill Co.: Carpenter, F.M. 1
Luzerne Co., Mill Creek limestone fauna: Ashburner, C.A. 35
mammals, Westmoreland Co.: King, A.T. 1, 2; Lyell, C. 3
pelecypods
  Cambria Co.: Conrad, T.A. 1
  Luzerne Co.: Claypole, E.W. 20; Girty, G.H. 2; Lea, I. 8
Pennsylvania: Jongmans, W.J. 6; Lesquereux, L. 6; Rogers, H.D. 24
  fauna: Weller, S. 1
  flora: Lesquereux, L. 2, 15; White, C.D. 10
plants
  Allegheny Co.: Darrah, W.C. 1; Gresley, W.S. 2; Grier, N.M. 1, 2
    popular: Leighton, H. 3
  Beaver Co.: King, A.T. 4
  Blair Co.: White, C.D. 4
  Cambria Co.: Harlan, R. 3
  Carbon Co.: Brongniart, A. 1; Göppert, J.H.R. 1; White, C.D. 3
  Dauphin Co.: Leidy, J. 8; Taylor, R.C. 9; White, C.D. 3
  Lackawanna Co.: Davis, R.N. 1; Eaton, A. 4; Teschemacher, J.E. 2
  Lawrence Co.: Lesquereux, L. 9
  Luzerne Co.: Gresley, W.S. 2
  Pennsylvania: Darrah, W.C. 6; Gresley, W.S. 8; Jongmans, W.J. 2, 3; Lesquereux, L. 1, 3, 4, 5, 13; White, C.D. 14; Wood, H.C. 1, 2, 3
    preservation: Lesquereux, L. 10
    types: Teschemacher, J.E. 3
    zones: Read, C.B. 2
  Schuylkill Co.: White, C.D. 3
  Tioga Co.: Teschemacher, J.E. 1
  Washington Co.: Darrah, W.C. 6
  Western: Kimball, J.P. 1; White, C.D. 2
  Westmoreland Co.: King, A.T. 5
  Wyoming Co.: Read, C.B. 1
reptiles
  Allegheny Co.: Case, E.C. 1; Raymond, P.E. 2; Moore, W.D. 1
  Luzerne Co.: Lacoe, R.D. 1; Packard, A.S. 1
  Schuylkill Co., track: Mason, W.D. 1
  Westmoreland Co.: King, A.T. 1; Lyell, C. 3, 4
snake, Susquehanna Co.: Eaton, A. 3
Southwestern: Stevenson, J.J. 5
  fossil localities: Raymond, P.E. 3
Western: Raymond, P.E. 4
  Ames limestone fauna: Seaman, D.M. 2
  Brush Creek limestone fauna: Seaman, D.M. 4
  Cambridge limestone fauna: Seaman, D.M. 3
Westmoreland Co., Pottsville fauna: Hall, C.E. 5
worms, Luzerne Co.: Miller, S.A. 3
xiphosuran, Luzerne Co.: Willard, B. 21

Permian
amphibians, Southwestern: Burke, J.J. 2
ostracodes, Greene Co.: Holland, W.C. 1; Scott, H.W. 1
plants, Southwestern: Darrah, W.C. 4; Fontaine, W.M. 1; Jongmans, W.J. 2, 5; Lesquereux, L. 5, 6; White, C.D. 9, 10
reptiles, Southwestern: Burke, J.J. 2

Quaternary
amphibians, Blair Co.: Peterson, O.A. 1
beaver, Monroe Co.: Leidy, J. 13, 16
birds, Blair Co.: Holland, W.J. 1; Peterson, O.A. 1
bison
  Bucks Co.: Rhoads, S.N. 1
  Pennsylvania: Allen, J.A. 1
cat, Montgomery Co.: Cope, E.D. 10
diatoms, Philadelphia Co., river clay: Cunningham, K.M. 1
Durham cave fauna, Berks Co.: Leidy, J. 16
elephant, Allegheny-Delaware Cos.: Leidy, J. 9
gastropods, Crawford Co.: Brooks, S.G. 1
human artifacts
  Bucks Co.: Lewis, H.C. 17
  Philadelphia Co.: Lewis, H.C. 30
hyena, Montgomery Co.: Cope, E.D. 10
insects: Horn, G.H. 1
mammals
  Blair Co.: Holland, W.J. 1; Leidy, J. 7; Peterson, O.A. 1
  Montgomery Co.: Cope, E.D. 5, 9, 11, 13
  Pennsylvania: Baird, S.F. 2
    bone caves: Cope, E.D. 4
  Tioga Co.: Edwards, T. 1

mammoths
  Fayette Co.: Price, P.H. 3
  Franklin Co.: Barton, B.S. 1
mastodons
  Erie Co., tooth: Van Rensselaer, J. 1
  Huntingdon Co.: Robinson, C.W. 1; Will, H.C. 1
  Pennsylvania: Barton, B.S. 3
Monroe Co., cave vertebrates: Darton, N.H. 1
peccarys
  Mifflin Co.: Leidy, J. 15, 16
  Monroe Co.: Leidy, J. 13, 16
Port Kennedy cave, Montgomery Co.: Wheatley, C.M. 2
reptiles
  Blair Co.: Holland, W.J. 1; Peterson, O.A. 1
  Montgomery Co., Port Kennedy cave: Cope, E.D. 13
tiger, Montgomery Co.: Cope, E.D. 10
tree, Philadelphia Co.: Richards, H.G. 1
vertebrates, Pennsylvania: Baird, S.F. 1; Hay, O.P. 1

Silurian
Berks Co., fossil localities: Willard, B. 9
Blair Co., Rochester-McKenzie faunas: Swartz, F.M. 6
brachiopods
  Blair-Mifflin Cos.: Simpson, G.B. 2
  Huntingdon Co.: Simpson, G.B. 2
  Mifflin Co., Keefer sandstone: Barnesley, E.R. 1
Columbia Co., fossil localities: Willard, B. 9
crinoid, Juniata Co.: Witmer, J.D. 1
eurypterids, Pennsylvania: Clarke, J.M. 4
fish, Perry Co.: Bryant, W.L. 1; Claypole, E.W. 9, 13, 18, 26
fucoids, Mifflin Co.: Harlan, R. 1; James, J.F. 2, 3; Taylor, R.C. 2, 3
graptolites
  Eastern: Ruedemann, R. 5
  Southeastern: Moore, R.C. 1
Juniata Co., fossil localities: Willard, B. 9
Monroe Co., fossil localities: Willard, B. 9
nautiloid, Columbia Co.: Mook, R.R. 1
Northumberland Co., fossil localities: Willard, B. 9
ostracodes
  Central: Swartz, F.M. 4
  Huntingdon Co.: Jones, T.R. 1; Ulrich, E.O. 7
  Juniata Co.: Ulrich, E.O. 7
  Pennsylvania: Jones, T.R. 2
  Perry Co.: Jones, T.R. 3
pelecypods
  Huntingdon Co.: Simpson, G.B. 2
  Mifflin-Tioga Cos.: Simpson, G.B. 2
Pennsylvania: Rogers, H.D. 24
  catalog: Lesley, J.P. 57
  fauna list: Bassler, R.S. 2
Perry Co., fossil localities: Willard, B. 9
Union Co., fossil localities: Willard B. 9
worms
  Juniata Co., Cinton group: Howell, B.F. 1, 9

Triassic
  Perry Co.: Howell, B.F. 9
algae, York Co.: Wanner, A. 1
amphibians
  Bucks Co.: Ryan, J.D. 1
  Chester Co.: Huene, F. von 1
branchiopods, Montgomery Co., Lockatong Formation: Bock, W. 2
Chester Co.: Lesley, J.P. 41; Wheatley, C.M. 1
coprolite: Lea, I. 11
crustaceans, York Co.: Wanner, H.E. 1, 2
dinosaurs
  Adams Co., popular: Anon. 41
  Montgomery Co.: Lyman, B.S. 12
  York Co.: Ashley, G.H. 82; Hickok, W.O. 4; Hitchcock, C.H. 10; Wanner, A. 1; Willard, B. 54
fish
  Chester Co.: Lea, I. 10; Leidy, J. 4, 5; Lewis, H.C. 35
  Montgomery Co.: Bryant, W.L. 2; Lea, I. 12; Leidy, J. 11
  York Co.: Wanner, H.E. 1
gastropod, York Co.: Wanner, H.E. 1
ostracodes
  Chester Co.: Leidy, J. 5
  York Co.: Wanner, H.E. 1
pelecypods
  Chester Co.: Conrad, T.A. 4; Lea, I. 10; Leidy, J. 4, 5; Lewis, H.C. 35; Richards, H.G. 2
  York Co.: Wanner, H.E. 1, 2
plants
  Bucks Co.: Brown, A.P. 4; Wherry, E.T. 20, 29
  Chester Co.: Leidy, J. 5; Lewis, H.C. 35
  Montgomery Co.: Carter, O.C.S. 8; Lyman, B.S. 12
  Southeastern: Ward, L.F. 2, 3; Wherry, E.T. 11
  York Co.: Wanner, A. 3
pterodactyl, Southeastern: Cope, E.D. 2
reptiles
  Bucks Co.: Sinclair, W.J. 1
  Chester Co.: Cope, E.D. 1, 3, 6; Heune, F. von 1; Lea, I. 10; Leidy, J. 5; Lewis, H.C. 35

    - Cumberland Co.: Willard, B. 19
    - Lehigh Co.: Lea, I. 6, 7
    - Montgomery Co.: Bock, W. 1; Colbert, E.H. 2
    - Southeastern: Colbert, E.H. 1; Cope, E.D. 7; Lea, I. 11
    - York Co.: Sinclair, W.J. 2; Wanner, H.E. 1, 2
  - Southeastern: Lesley, J.P. 67; Lyman, B.S. 6
  - worms, York Co.: Wanner, H.E. 1

PALEOZOIC, *see also* individual periods
  - Central: Swartz, F.M. 11
  - continental deposits: Grabau, A.W. 9; Willard, B. 55, 68
  - Huntingdon Co., Spruce Creek area: Rogers, R.D. 1
  - Lehigh Co.: Miller, B.L. 47; Prime, F. 4
  - Northampton Co.: Miller, B.L. 29, 39
  - Pennsylvania: Ashley, G.H. 20, 44; Claypole, E.W. 24; Hunt, T.S. 4; Kay, G.M. 3; Lesley, J.P. 67; Marcou, J. 2; Miller, S.A. 1; Nelson, W.A. 1; Rogers, H.D. 25; Schuchert, C. 21
    - limestone facies: Rogers, H.D. 15
    - popular: Ashley, G.H. 65, 66; Leeds, A.R. 5
    - sediment source: Claypole, E.W. 21
    - sedimentation and orogeny: Krynine, P.D. 2
  - Southeastern: Woodward, H.P. 1
  - Western: Johnson, R.H. 1; Swartz, F.M. 18
    - facies relations: Ashley, G.H. 62

PATTERSONITE
  - Chester Co.: Lea, I. 15

PEAT
  - Allegheny Co., Pleistocene: Schopf, J.M. 1
  - Bucks Co., Allentown quadrangle: Miller, B.L. 14
  - Lehigh Co., Allentown quadrangle: Miller, B.L. 14
  - Northampton Co.: Miller, B.L. 28
    - Allentown quadrangle: Miller, B.L. 14
  - Pennsylvania: Davis, C.A. 1

PECTOLITE
  - Lehigh Co.: Smith, E.F. 3

PEGMATITE
  - Delaware Co., corundum-bearing: Meier, A.E. 5
  - Northampton Co., Reading Prong, Paleozoic: Fraser, D.M. 4

PELECYPODA
  - Cambria Co., Pennsylvanian: Conrad, T.A. 1
  - Chester Co., Triassic: Conrad, T.A. 4; Lea, I. 10; Leidy, J. 4, 5; Lewis, H.C. 35; Richards, H.G. 2
  - Huntingdon Co., Mississippian, Pocono Formation: Girty, G.H. 3
  - Luzerne Co.
    - Pennsylvanian: Claypole, E.W. 20; Girty, G.H. 2; Lea, I. 8
    - Mill Creek limestone: Ashburner, C.A. 35
  - Northwestern
    - Devonian: Caster, K.E. 1, 10
    - Mississippian: Caster, K.E. 1
  - Pennsylvania
    - Devonian: Willard, B. 39
    - Ordovician-Devonian: Conrad, T.A. 3
  - Pike Co., Devonian, Hamilton group: Heilprin, A. 2
  - Warren Co., Mississippian, Waverly group: Beecher, C.E. 2
  - York Co., Triassic: Wanner, H.E. 1, 2

PENEPLAINS, *see also* Physiography
  - Central: Fridley, H.M. 1
  - Eastern, Harrisburg: Ver Steeg, K. 5
  - Franklin Co.: Stose, G.W. 3
  - Lackawanna Co.: Itter, H.A. 1
  - Lehigh Co.: Miller, B.L. 45
  - Luzerne Co.: Itter, H.A. 1
  - Northampton Co.: Miller, B.L. 36
  - Northern: Fridley, H.M. 1
  - Northwestern: Cole, W.S. 1
  - Pennsylvania: Bethune, P.F. de 1; Blood, P. 1; Buwalda, J.P. 1; Campbell, M.R. 16; Cole, W.S. 2; Johnson, D.W. 4; Stose, G.W. 27; Ver Steeg, K. 1, 2, 4, 6, 8, 9, 11; Von Engeln, O.D. 1
    - age: Ashley, G.H. 42, 45; Shaw, E.W. 6; Stose, G.W. 40
    - Cretaceous: Davis, W.M. 5
    - general: Ashley, G.H. 50
    - Harrisburg, Tertiary: Campbell, M.R. 3
    - Miocene: Meyerhoff, H.A. 5
    - origin: Ashley, G.H. 56
    - popular: Anon. 40, 55
    - post-Cretaceous: Barrell, J. 8
    - regional dip: Fridley, H.M. 3
    - Schooley: Ver Steeg, K. 7
    - Somerville, Tertiary: Campbell, M.R. 3
    - stream superposition: Johnson, D.W. 2
    - unnecessity: Eaton, H.N. 4
  - Pike Co., Delaware Valley: Happ, S.C. 1
  - Southeastern: Bartlett, R.L. 1; Bascom, F. 14; Dryden, A.L. 1; Hickok, W.O. 5; Knopf, E.F.B. 3; Ver Steeg, K. 12
    - faulted: Stose, G.W. 25

Somerville: Ward, F. 5
warped: Campbell, M.R. 14
Southwestern: Fridley, H.M. 2; Stone, R.W. 12
Western: Rich, J.L. 1; Ver Steeg, K. 10

PENNINITE
(pennine), Lancaster Co.: Pirsson, L.V. 1
(rhodochrome), Lancaster Co.: Dieffenbach, O. 1; Smith, J.L. 1
(rhodophyllite), Lancaster Co.: Genth, F.A. 5; Smith, J.L. 1

PENNSYLVANIA, *see also* Pennsylvania-Central, Eastern, Northern, Northeastern, Northwestern, Southcentral, Southwestern, Western, and individual counties
age determinations, popular: Anon. 34
diorama: Lobeck, A.K. 3
forests, relation to provinces, popular: Howell, T.R. 1
gravity anomalies: Woollard, G.P. 1, 4, 5
gravity survey: Nettleton, L.L. 1; Woollard, G.P. 6
Appalachia: Thom, W.T. 1
historical accounts: Myers, R.E. 6
isostatic warping: Glennie, E.A. 1
meteorites: Stone, R.W. 21, 34
popular: Anon. 31
statistics: Stone, R.W. 38
Pennsylvania Geological Survey: Stone, R.W. 42
history: Ashley, G.H. 23; Logue, T.A. 1
organization: Ashley, G.H. 31
popular: Ashley, G.H. 73
Pennsylvania railway guide: Macfarlane, J. 3
Pennsylvania turnpike
geologic problems, popular: Cleaves, A.B. 6
turnpike tunnels: Cleaves, A.B. 8
geologic sections: Cleaves, A.B. 4
problems: Anon. 49; Bevan, A.C. 2; Miller, B.L. 24
soil erosion: Patrick, A.L. 1
structural models: Lesley, J.P. 39
weathering rates: Hunt, T.S. 12
well temperatures: Hallock, W. 1; Van Orstrand, C.E. 2

Areal geology
Pennsylvania: Credner, H. 1; Detrick, W.S. 2; Gyss, E.B. 1; Keating, W.H. 1; Lyell, C. 2; Maclure, W. 1; Marcou, J. 4; Mease, J. 1; Rath, G. 1; Rogers, H.D. 1, 12, 25; Stone, R.W. 13; Trego, C.B. 1
popular: Ashley, G.H. 44

Economic geology
barite: Watson, T.L. 2
bitumen, coal source: Ashley, G.H. 26
cement: Eckel, E.C. 2; Lesley, J.P. 67
clay: Hice, R.R. 9; Leighton, H. 10; Lovejoy, E. 1; Ries, H. 1, 2, 4
analyses: McCreath, A.S. 3
origin: Hopkins, T.C. 11
coal: Anon. 2; Bowen, E. 1, 4; Boyd, C.R. 1; Burroughs, J.S. 2; Campbell, M.R. 11; Credner, H. 1; Daddow, S.H. 1; Eaton, A. 1; Macfarlane, J. 1, 2; Hayes, C.W. 1; Hitchcock, C.H. 4, 7; Hoeffer, H. 1; Lesley, J.P. 1; Logan, W.E. 1; Parker, E.W. 1; Pierce, J. 1; Plotts, W. 1, 3; Prime, F. 8; Roy, A. 1; Taylor, R.C. 10; Wethered, E. 1
analyses: Land, N.W. 1
classification: Frazer, P. 16
general: Cambell, M.R. 12
low sulphur: Chance, H.M. 19
origin: Rogers, H.D. 10; Stevenson, J.J. 22
popular: Andrews, E.B. 3; Nicolls, W.J. 1
rate of deposition: Ashley, G.H. 6
reserves: Kuhn, O.R. 1
total thickness: Ashley, G.H. 5
construction material, resources: Mattimore, H.S. 1
copper: Corbin, J.R. 5; Ross, C.S. 2; Weed, W.H. 1
fire clay: Ashley, G.H. 30; Chelikowsky, J.R. 1; Hudson, F. 1; Shaw, J.B. 1
analyses: McCreath, A.S. 5
ganister, distribution and reserves: Ashley, G.H. 30
glass sand: Fettke, C.R. 1
industrial minerals: Dolbear, S.H. 1; Stone, R.W. 30
iron: Birkinbine, J. 1; Corbin, J.R. 2; Credner, H. 1; Daddow, S.H. 1; Hickok, W.O. 2, 9; Hoeffer, H. 1; Hopkins, T.C. 9; Hunt, T.S. 16; Lesley, J.P. 4, 35, 67; Newberry, J.S. 5; Newton, H. 1; Putnam, B.T. 1; Rogers, W.B. 4; Silliman, B., Jr. 9; Smock, J.C. 2
analyses: McCreath, A.S. 1, 3, 5
bog iron ores, occurrence: Corbin, J.R. 1
limonite: Corbin, J.R. 3
origin: Chance, H.M. 18; Garrison, F.L. 1; Kimball, J.P. 3
popular: Foose, R.M. 10; Newberry, J.S. 3
lead: Lesley, J.P. 67

- limestone: Frear, W. 1, 3; Halberstadt, B. 3; Lesley, J.P. 67; Miller, B.L. 15, 18, 20; Swain, F.M. 2
  - analyses: Frear, W. 2; McCreath, A.S. 1, 5
- manganese: Foose, R.M. 7, 8; Harder, E.C. 2
  - popular: Foose, R.M. 10
- mineral resources: Ashley, G.H. 53, 76; Brown, A.P. 5; Dolbear, S.H. 1; Murphy, R.E. 1; Sanford, S. 1; Smock, J.C. 1
  - popular: Anon. 45; Ashley, G.H. 25, 35, 39, 44
- molding sand: Stone, R.W. 26
- oil shale: Ashley, G.H. 26; Fettke, C.R. 5
- paint ore: Miller, B.L. 1, 2
- peat: Davis, C.A. 1
- petroleum, shale and coal sources: Fettke, C.R. 3
- road building material: Ihlseng, M.C. 2
- salt: B. and O. RR. Co., Indus. Dev. Staff 1; Pierce, J. 1
- sand: Fettke, C.R. 1, 2; Stone, R.W. 22
- shale: Leighton, H. 10
  - oil-bearing: Ashley, G.H. 26; Fettke, C.R. 5
- silica refractories: Moore, E.S. 4
- stone: Downey, M.G. 1; Hawes, G.W. 1; Merrill, G.P. 5; Stone, R.W. 24, 31
  - popular: Anon. 36; Merrill, G.P. 2
- zinc: Lesley, J.P. 67

Ground water

- analyses, bibliography: Collins, W.D. 1
- bibliography: Fuller, M.L. 6
- deep borings: Darton, N.H. 3
- general: Fuller, M.L. 8
  - popular: Adamson, J.H. 1; Graham, J.B. 2
- Pennsylvania: Lohman, S.W. 5
- popular: Stone, R.W. 48
- reserves, popular: Ashley, G.H. 78
- springs: Anon. 33; Fitch, W.E. 1; Fuller, M.L. 8; Mangan, J.W. 1; Meinzer, O.E. 1
- temperature: Darton, N.H. 9

Historical geology

- Appalachian basin, westward extension: Ashley, G.H. 7
- Appalachian geosyncline: Kay, G.M. 5; Schuchert, C. 8
- Appalachian highlands: Billings, M.P. 1
- Cambrian: Bassler, R.S. 3; Howell, B.F. 5; Lesley, J.P. 67; Murdy, R.J. 1; Resser, C.E. 1; Walcott, C.D. 4; Whaley, J.H. 1; Wilson, J.L. 1
  - limestones: Miller, B.L. 18
  - overlap: Grabau, A.W. 5
- Cambrian-Ordovician: Bassler, R.S. 3; Grabau, A.W. 15
- Cambrian-Pennsylvanian: Rogers, H.D. 2
- Cambrian-Silurian: Grabau, A.W. 6; Hunt, T.S. 3
- Cenozoic: Hunt, T.S. 4; Keith, A. 5; Miller, S.A. 1; Schuchert, C. 3
- Cretaceous-Quaternary: Braun, E.L. 1
- Cretaceous-Tertiary: Barrell, J. 5
- Devonian: Ashley, G.H. 36; Caster, K.E. 4, 8; Chadwick, G.H. 5, 6; Clarke, J.M. 3; Claypole, E.W. 27; Cooper, G.A. 5; Dawson, J.W. 1; Grabau, A.W. 12; Hall, J. 10; Rogers, W.B. 1; Stevenson, J.J. 14; Willard, B. 27, 53; Williams, H.S. 4, 5, 6, 8
  - Catskill delta: Barrell, J. 6
  - Catskill Formation: Chadwick, G.H. 2; White, C.D. 2; Willard, B. 13
  - Catskill-Chemung relations: Barrell, J. 4; Stevenson, J.J. 12
  - Hamilton group: Willard, B. 37
  - Helderberg limestone group: Fischer, F.W. 1; Swartz, F.M. 10
  - Onondaga limestone: Eaton, A. 5; Kindle, E.M. 2; Weller, S. 3; Willard, B. 35
  - Oriskany sandstone: Claypole, E.W. 22; Cleaves, A.B. 5; Finn, F.H. 1; Leighton, H.E. 1; Myers, T.H. 1
    - thickness: Cleaves, A.B. 3
  - overlap: Grabau, A.W. 5
  - Portage group: Willard, B. 29
  - terminology: Willard, B. 36
  - Tully limestone: Willard, B. 39
- Devonian-Mississippian: Arnold, C.A. 6; Honess, C.W. 1; Ver Wiebe, W.A. 4; Weller, S. 4
- Devonian-Pennsylvanian: Lesley, J.P. 67
- Devonian-Permian: Butts, C. 19
  - climate: White, C.D. 11
  - orogenies: Waterschoot van der Gracht, W.A.J.M. 1
- Mesozoic: Hopkins, T.C. 3; Hunt, T.S. 4; Keith, A. 5; Miller, S.A. 1; Rogers, H.D. 25; Schuchert, C. 3, 21
- Mississippian: Beck, R.W. 1; Cheney, M.G. 1; Cooper, B.N. 1; Moore, R.C. 2; Rigney, H.W. 1; Rogers, W.B. 5; Stevenson, J.J. 19; Weller, J.M. 1; Weller, S. 2; Williams, H.S. 6
  - Catskill Formation: Prosser, C.S. 1
  - Mauch Chunk Formation: Barrell, J. 3; Stevenson, J.J. 17
  - overlap: Grabau, A.W. 5

  Pocono sandstone: Claypole, E.W. 22; Halberstadt, B. 4; White, C.D. 13
  history of terminology: Ashley, G.H. 57
Mississippian-Pennsylvanian: Butts, C. 9; Lesquereux, L. 7, 8; Marcou, J. 3; Moore, R.C. 4; Stevenson, J.J. 11
Mississippian-Permian: Jongmans, W.J. 5
Mississippian-Triassic: Stevens, R.P. 2
Ordovician: Ashley, G.H. 41; Bassler, R.S. 3; Galey, J.T. 1; Kay, G.M. 1; Knopf, E.F.B. 2; Lesley, J.P. 67; Murdy, R.J. 1; Prouty, C.E. 1
  bentonite: Rosenkrans, R.R. 2, 3
  clastics: Willard, B. 60
  deltas: Grabau, A.W. 11
  limestone: Miller, B.L. 18
Ordovician-Devonian: Conrad, T.A. 3; Grabau, A.W. 7
Ordovician-Mississippian: Swartz, F.M. 22
Ordovician-Silurian: Schuchert, C. 11; Ulrich, E.O. 5; Willard, B. 51
Paleozoic: Eaton, A. 2; Hopkins, T.C. 3; Hunt, T.S. 4; Kay, G.M. 3; Keith, A. 5; Miller, S.A. 1; Rogers, H.D. 25; Schuchert, C. 3, 21; Ulrich, E.O. 1; Ver Wiebe, W.A. 7; Vicaire, A. 1
  continental deposits: Grabau, A.W. 9; Willard, B. 55, 68
  deltas: Grabau, A.W. 10
  general: Ashley, G.H. 20
  limestone facies: Rogers, H.D. 15
  orogeny: Marcou, J. 2
  popular: Ashley, G.H. 66; Leeds, A.R. 5
  sediment source: Claypole, E.W. 21
  sedimentation and orogeny: Krynine, P.D. 2
Pennsylvanian: Ashley, G.H. 36, 46, 58, 67; Bevan, A.C. 1; Boyd, C.R. 1; Burrows, J.S. 2; Caddell, H.M. 1; Cheney, M.G. 1; Grabau, A.W. 3; Hitchcock, C.H. 1; Jongmans, W.J. 1, 3; Keyes, C.R. 2; Lesley, J.P. 3; Lesquereux, L. 2; Levorsen, A.I. 1; Martens, J.H. 2; Moore, R.C. 3, 5, 6; Rogers, H.D. 10; Savage, T.E. 2; Simmersbach, B. 1; Stevens, R.P. 1; Wanless, H.R. 1, 2, 3; Weaver, T. 1; White, C.D. 1, 8; White, I.C. 13; Williams, H.S. 6
  anthracite-bituminous contemporaneity; Johnson, W.R. 10
  coal origin: Willard, B. 66
  extent of boundaries: Lyman, B.S. 14
  nomenclature: Ashley, G.H. 28
  overlap: Grabau, A.W. 5
  Pottsville conglomerate: Branner, J.C. 1; Claypole, E.W. 22
  Pottsville-Pittsburgh boundary: Ashley, G.H. 84
Pennsylvanian-Permian: Darrah, W.C. 5; Lesquereux, L. 5; Stevenson, J.J. 20
Pleistocene, biogeography: Deevey, E.S. 1
popular: Willard, B. 28
Precambrian-Ordovician: Winchell, A. 1
Precambrian-Recent: Claypole, E.W., 24
  popular: Ashley, G.H. 65; Stone, R.W. 55
Precambrian-Tertiary: Ashley, G.H. 44; Willis, B. 8
problems: Bevan, A.C. 2
Quaternary: Hopkins, T.C. 3; Hunt, T.S. 4; McGee, WJ 2
Silurian: Claypole, E.W. 10; Conrad, T.A. 2; Lesley, J.P. 67; Swartz, C.K. 2, 8; Ulrich, E.O. 6
  Clinton sand: Swain, J.F. 1
  delta: Grabau, A.W. 11
  Medina Formation: Chadwick, G.H. 3; Claypole, E.W. 22
  Shawangunk-Oneida relations: Grabau, A.W. 4
  Tuscarora Formation: Ulrich, E.O. 4
Silurian-Devonian: Romer, A.S. 1; Swain, F.M. 13

Maps
Economic
  building stone: Stone, R.W. 31
  cement: Burchard, E.F. 1
  coal: Averitt, P. 1; Campbell, M.R. 7, 12; Hewitt, A.S. 1; Hitchcock, C.H. 7; Lesher, C.E. 1; Owen, D.D. 1; Prime, F. 8; Sisler, J.D. 25; Tryon, F.G. 1
  iron: Hewitt, A.S. 1
  limestone: Miller, B.L. 15, 20
  mineral resources: Wilson, J.F. 1
  peat: Davis, C.A. 1
  salt: B. and O. RR. Co., Indus. Dev. Staff 1
Geologic: Boyd, C.R. 1; Bradley, F.H. 1; Credner, H. 1; Hall, J. 2; Hitchcock, C.H. 5, 6, 9; Lesley, J.P. 17, 67; Lobeck, A.K. 1; Logan, W.E. 2; Lyell, C. 2; Maclure, W. 1; McGee, WJ 1, 3; Marcou, J. 1, 2, 4, 5; Rogers, H.D. 23; Stose, G.W. 30, 31, 43; Williams, W.A. 1; Willis, B. 5, 7
Geophysical, gravity: Woollard, G.P. 4
Isopach
  Appalachian geosyncline: Fischer, R.A. 1

    - Cambrian-Pennsylvanian: Ver Wiebe, W.A. 7
- Isovol: Sisler, J.D. 20
- Paleogeographic
  - Mesozoic: Willis, B. 6
  - Paleozoic: Willis, B. 6
  - Tertiary: Willis, B. 6
- Physiographic
  - glacial deposits: Ashley, G.H. 52; Chamberlin, T.C. 6; Flint, R.F. 1; Leverett, F. 5; Torbert, J.B. 1
  - Harrisburg peneplain: Campbell, M.R. 3
  - preglacial drainage: Lesley, J.P. 51
  - Schooley peneplain: Ver Steeg, K. 7
  - terminal moraine: Lesley, J.P. 51; Lewis, H.C. 37
- Structure: Longwell, C.R. 2; Republic Explor. Co. 1
- Structure contour, Devonian: Finn, F.H. 1

Mineralogy

- analyses: Genth, F.A. 11, 12
- mineral locations: Dana, E.S. 3; Genth, F.A. 11, 12; Gordon, S.G. 7; Robinson, S. 1
- pyrite in coal: Ashley, G.H. 15

Paleontology

- ammonoids, Devonian: Miller, A.K. 3
- amphibians, Pennsylvanian: Moodie, R.L. 1, 2
- bisons, Quaternary: Allen, J.A. 1
- brachiopods
  - Cambrian: Hitchcock, C.H. 2
  - Devonian: Bye, D.L. 1
- Bryozoa, Paleozoic: Bassler, R.S. 1
- Cambrian fauna: Rogers, H.D. 24
- catalog: Lesley, J.P. 57
- conulariids, Devonian: Swartz, F.M. 14
- crustaceans, Paleozoic: Vodges, A.W. 2
- Devonian
  - Onondaga fauna: Weller, S. 3
  - Tully limestone fauna: Willard, B. 39
- Devonian fauna: Chadwick, G.H. 6; Clarke, J.M. 3; Claypole, E.W. 27; Grabau, A.W. 1; Nelson, L.A. 1; Rogers, H.D. 24; Willard, B. 8, 53
- Devonian flora: Dawson, J.W. 1
- eurypterids, Paleozoic: Clarke, J.M. 4
- faunal lists: Lesley, J.P. 67
- fish, Devonian: Newberry, J.S. 8
- fossil collecting localities: Simpson, G.B. 1
- insects, Pennsylvanian: Scudder, S.H. 2
- mammals, Quaternary: Baird, S.F. 2; Cope, E.D. 4
- man, Pleistocene, popular: Anon. 37
- mastodons, Pleistocene: Barton, B.S. 3
- Mississippian fauna: Rogers, H.D. 24; Weller, S. 1
- Ordovician fauna: Bassler, R.S. 2; Rogers, H.D. 24
- ostracodes
  - Devonian: Swartz, F.M. 16
  - Ordovician-Silurian: Jones, T.R. 2
  - Paleozoic: Cooper, C.L. 1; Ulrich, E.O. 2
- paleontological review: Sheafer, P.W. 1
- Pennsylvanian fauna: Weller, S. 1
- plants
  - bibliography: Ward, L.F. 1
  - Devonian: Arnold, C.A. 6, 7; White, C.D. 10
  - Mississippian: Arnold, C.A. 6; White, C.D. 10, 12
    - Catskill Formation: Prosser, C.S. 1
  - Paleozoic: Lesquereux, L. 16
  - Pennsylvanian: Darrah, W.C. 6; Gresley, W.S. 8; Jongmans, W.J. 2, 3, 6; Lesquereux, L, 1, 2, 3, 4, 5, 6, 13, 15; Read, C.B. 2; Rogers, H.D. 24; Teschemacher J.E. 3; White, C.D. 10, 14; Wood, H.C. 1, 2, 3
  - Pennsylvanian-Permian flora: Lesquereux, L. 11
  - Permian: Jongmans, W.J. 2; Lesquereux, L. 5, 6; White, C.D. 10
  - preservation examples: Lesquereux, L. 10
- popular: Willard, B. 32
- Silurian fauna: Bassler, R.S. 2; Rogers, H.D. 24
- trilobites
  - Devonian: Swartz, F.M. 15
  - Paleozoic: Vodges, A.W. 2
- vertebrates
  - Pleistocene: Baird, S.F. 1
  - popular: Anon. 53
  - Quaternary: Hay, O.P. 1
- worms, Cambrian: Hitchcock, C.H. 2

Petrology

- coal: Turner, H.G. 1
  - anthracite, wood-bearing: Bunker, J.M. 1
- dolomite: Rogers, R.E. 1
- oil sands
  - popular: Anon. 46
  - porosity: Barb, C.F. 1; Honess, A.P. 3
- Oriskany sandstone, porosity: Krynine, P.D. 6; Stow, M.H. 1
- Paleozoic formations, relation to orogeny: Krynine, P.D. 2
- problems: Bevan, A.C. 2
- sandstone, porosity-permeability relations: Barb, C.F. 1
- sedimentary porosity: Krynine, P.D. 11

Physical geology

- Appalachian geosyncline: Dana, J.D. 1; Schuchert, C. 8
- Appalachian Mtns.
  - formation: Keith, A. 5
  - original height: Longwell, C.R. 1
- crustal shortening: Claypole, E. W. 19; Lutz, K. 1
- earthquakes: Landsberg, H. 1
  - popular: Anon. 60; Stone, R.W. 57
- folds, origin: Rogers, H.D. 6
- lineaments: Hobbs, W.H. 1
- metamorphism: Hietanen, A.M. 2; Stevenson, J.J. 9
- orogeny
  - Devonian-Permian: Waterschoot van der Gracht, W.A.J.M. 1
  - late Paleozoic: Moore, R.C. 2
- structural complexities: Hietanen, A.M. 2
- structural elements: Schuchert, C. 21
- structural geology: Hietanen, A.M. 1, 2; Lesley, J.P. 46; Shatsky, N.S. 1
  - Allegheny Front: Price, P.H. 1
  - Appalachian faults: Willis, B. 2
  - Appalachian Mtns.: Keith, A. 3; Lesley, J.P. 10; Rodgers, J. 1; Rogers, W.B. 2; Sherrill, R.E. 6
    - popular: Ashley, G.H. 74
  - cleavage orientation: Rogers, H.D. 11
  - coal distortion: Wasmuth, H.A. 3
  - coal-basin structures: Rogers, H.D. 17
  - deformation effects: Gair, J.E. 1
  - mechanics: Ashley, G.H. 8; Willis, B. 3
  - relation to base level: Chittendon, A.P. 1
  - relation to gravity anomalies: Wollard, G.P. 1
  - relation to petroleum: Clapp, F.G. 8
  - tangential arcs: Uhrig, L.F. 1

Physiography

- Appalachian drainage: Davis, W.M. 4; Mackin, J.H. 4; Thompson, H.D. 1
  - Permo-Triassic origin: Meyerhoff, H.A. 4
- Appalachian Mtns.: Guyot, A. 1; Willis, B. 4
- boulder fields: Peltier, L.C. 1
- caves: Stone, R.W. 27, 35, 50, 53
  - bone-bearing: Baird, S.F. 1
  - popular: Stone, R.W. 52
  - structural effects: Stone, R.W. 28
- drainage changes
  - faunal evidence: Ortmann, A.E. 1
  - Pleistocene: Hice, R.R. 6
- drainage patterns: Johnson, D.W. 4; Thompson, H.D. 2; Woodward, H.P. 2
  - origin: Mackin, J.H. 2; Strahler, A.N. 1
  - structural control: Meyerhoff, H.A. 3, 6
  - superposition: Johnson, D.W. 2, 3
- erosion surfaces: Blood, P. 1
- glacial boundary: Wright, G.F. 1, 3, 4, 15
- glacial drift, age: Ashley, G.H. 63; Chamberlin, T.C. 4
  - pre-Wisconsin: Lewis, J.F. 1
- glacial features: Flint, R.F. 1; Williams, E.H. 9; Wright, G.F. 5
  - popular: Anon. 51
  - pre-Wisconsin: Leverett, F. 5
- glacial geology: Lewis, H.C. 33
  - terminal moraine: Lewis, H.C. 37
- glacial lakes, Kansan: Williams, E.H. 14
- glaciation: Tower, W.S. 1
- high elevations, popular: Anon. 32
- lineaments: Hobbs, W.H. 1
- mountain systems: Marcou, J. 2
- peneplains: Barrell, J. 8; Béthune, P.F. de 1; Buwalda, J.P. 1; Campbell, M.R. 3; Cole, W.S. 2; Fenneman, N.M. 1, 2; Johnson, D.W. 4, 6; Stose, G.W. 27; Ver Steeg, K. 1, 2, 4, 6, 8, 9, 11; Von Engeln, O.D. 1
  - age: Ashley, G.H. 42; Shaw, E.W. 6; Stose, G.W. 40
  - Chambersburg: Campbell, M.R. 16
  - Cretaceous: Davis, W.M. 5
  - general: Ashley, G.H. 50
  - Miocene: Meyerhoff, H.A. 5
  - popular: Anon. 40, 55
  - regional dip: Fridley, H.M. 3
- Pennsylvania: Bretz, J.H. 1; Bryan, K. 1; Loomis, F.B. 1; Murphy, R.E. 1; Powell, J.W. 1; Tower, W.S. 1
  - age of features: Ashley, G.H. 45
  - features: Ashley, G.H. 56; Rogers, H.D. 21
  - origin: Lesley, J.P. 7
  - physiographic development, popular: Anon. 39; Ashley, G.H. 64
  - physiographic provinces: Atwood, W.W. 1; Keith, A. 2
  - popular: Ashley, G.H. 66; Bechdolt, A.F. 1
- problems: Bevan, A.C. 2
- scenery, origin: Ashley, G.H. 52
- soil erosion: Patrick, A.L. 1
- subordinate ridges, origin: Eaton, H.N. 4
- terraces: Barrell, J. 8; Stose, G.W. 28
  - Cretaceous-Tertiary: Barrell, J. 5
  - multiple-glaciation evidence: Chamberlin, T.C. 2
  - Susquehanna River: Peltier, L.C. 2
- water gaps: Meyerhoff, H.A. 2; Ver Steeg, K. 2, 3; Wilson, J.W. 1

    - popular: Johnson, D.W. 7
  - wind gaps: Meyerhoff, H.A. 2; Ver Steeg, K. 3

PENNSYLVANIA-CENTRAL, *see also* Pennsylvania, and individual counties

Areal geology
- Central: Williams, G.H. 3

Economic geology
- aluminum, underclay: Sanford, R.S. 1
- iron: Hopkins, T.C. 7
- sand and gravel: Ward, F. 1

Ground water
- Central: Lohman, S.W. 3
- resources: Lohman, S.W. 2

Historical geology
- Cambrian: Ulrich, E.O. 3; Wilson, J.L. 2
- Canadian: Ulrich, E.O. 3
- Devonian: Butts, C. 17; Willard, B. 45
  - Hamilton group: Claypole, E.W. 25; Willard, B. 24, 25
  - Helderberg limestone: Reeside, J.B. 1; Swartz, F.M. 1
  - Oriskany sandstone: Stow, M.H. 3
  - Tully limestone: Cooper, G.A. 3
- Ordovician: Craig, L.C. 1; Field, R.M. 2, 3; Kay, G.M. 5; Prouty, C.E. 2; Ulrich, E.O. 3
  - bentonite: Bonine, C.A. 2; Rosenkrans, R.R. 1; Whitcomb, L. 2, 7
- Ordovician-Silurian: Krynine, P.D. 7; Swartz, F.M. 20
- Ozarkian: Ulrich, E.O. 3
- Paleozoic: Swartz, F.M. 11
- Silurian: Swartz, C.K. 4, 5; Swartz, F.M. 5, 7
  - McKenzie shale: Swartz, F.M. 2

Maps
- Geologic: Lohman, S.W. 2, 3
  - Harrisburg-Newport: Willard, B. 41
  - Pleistocene deposits: Lohman, S.W. 3

Mineralogy
- tourmaline, Oriskany sandstone: Stow, M.H. 2

Paleontology
- cephalopods, Ordovician: Richardson, E.S. 1
- conulariids
  - Devonian: Richardson, E.S. 1
  - Ordovician: Richardson, E.S. 1
- Devonian
  - Hamilton fauna: Claypole, E.W. 25
  - Helderberg fauna: Reeside, J.B. 1; Swartz, F.M. 1
  - Onondaga fauna: Swain, F.M. 1
- ostracodes
  - Devonian: Swartz, F.M. 3, 8, 9, 12
  - Silurian: Swartz, F.M. 4
- trilobites, Cambrian: Wilson, J.L. 2

Petrology
- Bald Eagle sandstone, Ordovician: Rogers, Reginald D. 1
- carbonates, Cambrian-Ordovician: Sadler, J.W. 1
- chert, Ordovician: Folk, R.L. 2
- conglomerate, Ordovician, fossil-formed: Eaton, H.N. 3
- Gatesburg Formation, Cambrian: Pelts, C.R. 1
- Juniata sandstone, Ordovician: Rogers, Reginald D. 1
- oolites: Brown, T.C. 3; Krynine, P.D. 8
- Ordovician-Silurian, heavy minerals: Tuttle, O.F. 1
- Oriskany sandstone, Devonian, tourmaline: Stow, M.H. 2
- Paleozoic sediments, source: Krynine, P.D. 3
- Tuscarora sandstone, Silurian: Rogers, Reginald D. 1

Physical geology
- Birmingham overthrust: Lesley, J.P. 23
- crustal shortening: Chamberlin, R.T. 1
- faulting: Ashley, G.H. 2; Parker, J.M. 1
- folding: Chamberlin, R.T. 1
- structure, Nittany Valley: Ayers, V.L. 1

Physiography
- caves: Zeller, R.A. 1
  - popular: Zeller, R.A. 2
- drainage changes, Susquehanna River: Anon. 52
- gravels, Susquehanna River: Bashore, H.B. 3
- peneplains: Fridley, H.M. 1
- terraces, Susquehanna River: Bashore, H.B. 2

PENNSYLVANIA-EASTERN, *see also* Pennsylvania, Pennsylvania-Northeastern, Pennsylvania-Southeastern, and individual counties
- gravity anomalies: Woollard, G.P. 3
  - structural control: Woollard, G.P. 2

Areal geology
- Eastern: Cook, G.H. 1; Finch, I. 1

Economic geology
- barium: Lesley, J.P. 67
- coal, anthracite, river-borne: Hills, J.M. 1; Webbert, C.W. 1
- gold, popular: Stone, R.W. 46
- manganese: Harder, E.C. 4
- metal resources, popular: Stone, R.W. 51

slate: Behre, C.H. 9; Keesler, D.W. 1; Lesley, J.P. 67
popular: Merrill, G.P. 3

Historical geology
Cambrian: Resser, C.E. 2
Devonian
Chemung shore line: Willard, B. 20
Hamilton group: Willard, B. 17
Onondaga limestone: Kindle, E.M. 3
Ordovician, Levis trough: Ashley, G.H. 81
Pleistocene, Pensauken gravel: Campbell, M.R. 17
Precambrian-Recent, Appalachia topography: Nelson, W.A. 1
Quaternary, Trenton gravel: Lewis, H.C. 2
Silurian, Shawangunk-Medina, problem: Grabau, A.W. 8

Maps
Geologic: Cook, G.H. 1; Kerr, P.F. 1
Geophysical, gravity anomalies: Woollard, G.P. 2, 3
Paleogeographic, Chemung shore line: Willard, B. 20

Paleontology
Devonian, Onondaga fauna: Kindle, E.M. 3
graptolites, Ordovician-Silurian: Ruedemann, R. 5

Physical geology
Levis trough: Ashley, G.H. 81
structure, Kittatinny Mtn.: Miller, B.L. 48

Physiography
drainage changes: Bliss, E.F. 3
Eastern: Evans, L. 1
geomorphology, generalized: Johnson, D.W. 5
glacial drift, extramorainic: Salisbury, R.D. 1
glacial features: Wright, G.F. 9
Harrisburg peneplain: Ver Steeg, K. 5
terraces, Delaware River: Wright, G.F. 10
Pensauken gravel, origin and structure: Campbell, M.R. 17
wind gaps: Ver Steeg, K. 5

PENNSYLVANIA-NORTHEASTERN, *see also* Pennsylvania, Pennsylvania-Eastern, Pennsylvania-Northern, and individual counties
Pottsville conglomerate, Pennsylvanian, weathering: Winslow, A. 1

Areal geology
anthracite region: Ashburner, C.A. 21

Economic geology
coal, anthracite: Ashburner, C.A. 19, 21, 22, 25; Austin, A.C. 1; Caddell, H.M. 1; Green, W. 1; Griffith, W. 2, 4; Haetter, J.H. 1; Hardman, E.T. 1; Lesley, J.P. 67; Lyell, C. 2; Meade, W. 1; Parker, E.W. 2; Rogers, H.D. 5, 8, 14; Rothrock, H.E. 1; Silliman, B. 2; Smith, A. de W. 2; Stoek, H.H. 2; Storrs, A.H. 1; Taylor, R.C. 8; Thomas, J.P. 1
analyses: McCreath, A.S. 3; Johnson, W.R. 5
correlation: Turner, H.G. 2
fields: Ashburner, C.A. 20, 36; Hill, F.A. 3
general: Campbell, M.R. 13, 15
limits: Althouse, H.W. 3
origin: Ashley, G.H. 20; Jeffrey, E.C. 2; Gresley, W.S. 6; Stevenson, J.J. 15
phosphorus content: Britton, J.B. 1
popular: Bowen, E. 2
reserves: Ashley, G.H. 18, 61, 77; Ashmead, D.C. 1
sand and gravel: Ward, F. 2

Ground water
Northeastern: Lohman, S.W. 1

Historical geology
Cambrian-Pennsylvanian, anthracite region: Ashburner, C.A. 21
Devonian: Cooper, G.A. 4; Willard, B. 31
Oriskany sandstone: Swartz, C.K. 6; Willard, B. 5
Tully limestone: Skinner, W.S. 1; Stevenson, R.E. 2
Devonian-Mississippian: Willard, B. 31
Pennsylvanian: Ashburner, C.A. 19, 25; Austin, A.C. 1; Green, W. 1; Griffith, W. 4; Rogers, H.D. 14; Seidl, E. 1
anthracite correlation: Ashburner, C.A. 36; Turner, H.G. 2
anthracite region: Ashley, G.H. 61; Hill, F.A. 3; Lyell, C. 1
Pottsville Formation: Brainerd, J. 1
Precambrian glaciation: Rogers, H.D. 7
Silurian: Miller, B.L. 17; Schuchert, C. 4; Stose, G.W. 29; Swartz, C.K. 3, 5; Van Ingen, G. 3
Medina Formation: Eaton, H.N. 5
Shawangunk Formation: Billingsley, P. 1; Willard, B. 1
Silurian-Devonian: Swartz, C.K. 7
Silurian-Pennsylvanian: Rogers, H.D. 3, 5

Maps
- Economic
  - coal, anthracite: Alder and Co. 1; Ashburner, C.A. 26; Bowen, E. 1; Daddow, S.H. 1; Fisher, S.B. 1; Hill, F.A. 3; Smith, A. deW. 3
    - fields: Ashburner, C.A. 2, 25; Smith, A. deW. 1
- Geologic: Lohman, S.W. 1
  - anthracite area: Rogers, H.D. 22
  - anthracite fields: Ashburner, C.A. 25
  - Devonian-Mississippian: Willard, B. 31
  - Devonian Catskill facies: Willard, B. 53
- Physiographic, kames: Lewis, H.C. 40
- Structure: Ashley, G.H. 49
  - anthracite basins: Darton, N.H. 6

Paleontology
- plants, Devonian, Marcellus-Portage Formations: Arnold, C.A. 10
- reptiles, Mississippian: Rogers, H.D. 19

Petrology
- coal, anthracite: Hardman, E.T. 1
- Mauch Chunk Formation, Mississippian, color: Brown, A.P. 3; Wistar, I.J. 1

Physical geology
- structure
  - anthracite fields: Ashburner, C.A. 25; Ashley, G.H. 72; Darton, N.H. 6; Kemp, J.F. 9; Lesley, J.P. 3; Parker, E.W. 2; Rogers, H.D. 14; Seidl, E. 1; Wasmuth, H.A. 1
  - folds and faults: Taylor, R.C. 8

Physiography
- drainage changes: Leverett, F. 1
- glacial lake: Davis, W.M. 1
- glacial striae: Rogers, H.D. 9
- high-level drift: Lesley, J.P. 40

PENNSYLVANIA-NORTHERN, *see also* Pennsylvania, Pennsylvania-Northeastern, Pennsylvania-Northwestern, and individual counties

Economic geology
- coal, bituminous: Taylor, R.C. 5
- natural gas: Fettke, C.R. 19; Hamilton, S.H. 3; Robinson, J.F. 5; Torrey, P.D. 3
- petroleum: Cathcart, S.H. 1; Hamilton, S.H. 3; Torrey, P.D. 3
- salt: Stone, R.W. 47

Ground water
- Northcentral: Lohman, S.W. 3

Historical geology
- Cambrian-Ordovician: Swartz, F.M. 23
- Cambrian-Pennsylvanian: Torrey, P.D. 3
- Devonian: Caster, K.E. 9; Chadwick, G.H. 7; Robinson, J.F. 5
  - Catskill Formation: Fuller, M.L. 1
  - Oriskany sandstone: Fettke, C.R. 19
  - Tully-Genessee relationships: Grabau, A.W. 14
- Devonian-Mississippian: Hall, J. 5
- Devonian-Pennsylvanian, thicknesses: Cathcart, S.H. 10
- Mississippian: Willard, B. 62
  - Pocono Formation: Chadwick, G.H. 4
- Ordovician-Devonian: Cathcart, S.H. 11
- Paleozoic: Taylor, R.C. 5
- Silurian-Devonian: Fettke, C.R. 8

Maps
- Geologic: Lohman, S.W. 3
  - Pleistocene deposits: Lohman, S.W. 3
- Structure: Cathcart, S.H. 7; Robinson, J.F. 6
- Structure contour, Oriskany sandstone, Devonian: Ingham, A.I. 1

Paleontology
- bryozoans, Devonian: McNair, A.H. 1
- Devonian fauna: Williams, H.S. 9

Petrology
- Oriskany sandstone, Devonian: Hamilton, S.H. 3

Physical geology
- joints: Parker, J.M. 2
- structure: Torrey, P.D. 3

Physiography
- drainage changes
  - Pleistocene: Williams, E.H. 12
  - Susquehanna River: Burroughs, W.G. 4
- glacial drift, Kansan: Williams, E.H. 6, 10
- glacial features: Ashley, G.H. 37; Leverett, F. 3; Williams, E.H. 13
- glacial geology: MacClintock, P. 1
- glacial lakes: Young, A.E. 1
- glacial topography: Chamberlin, T.C. 3
- moraines: Lewis, H.C. 34; Wahnschaffe, F. 1; Wright, G.F. 2
- peneplains: Fridley, H.M. 1
- physiographic provinces, Susquehanna Basin: Hollister, G.B. 1
- "thru valleys," glacial origin: Anon. 44

PENNSYLVANIA-NORTHWESTERN, *see also* Pennsylvania, Pennsylvania-Northern, Pennsylvania-Western, and individual counties

Economic geology
- natural gas: Fettke, C.R. 14; Newberry, J.S. 2; Torrey, P.D. 6

- petroleum: Beers, F.W. 1; Fettke, C.R. 11, 13, 14; Lesley, J.P. 51; Ridgway, T.S. 2; Rogers, H.D. 27, 28; Sayles, I. 1; Wrigley, H.E. 2
  - stratigraphic traps: Sherrill, R.E. 7
  - well records: Lesley, J.P. 29

Ground water
- Northwestern: Leggette, R.M. 1

Historical geology
- Cambro-Ordovician, subsurface: Fettke, C.R. 30
- Devonian: Cohn, H.H. 1; Lesley, J.P. 29; Ridgway, T.S. 2; Ver Wiebe, W.A. 2
- Devonian-Mississippian: Carll, J.F. 3; Caster, K.E. 2, 3, 5, 7
- Devonian-Pennsylvanian: Girty, G.H. 1; Glenn, L.C. 1; Lesley, J.P. 51; Rogers, H.D. 3; Swartz, C.C. 1
  - correlation with Ohio and New York: Lesley, J.P. 21
- Mississippian: Ver Wiebe, W.A. 3
- Ordovician-Devonian: Fettke, C.R. 13
- Ordovician-Pennsylvanian: Fettke, C.R. 12
- Pennsylvanian, Sharon conglomerate: White, I.C. 8
- Silurian: Rittenhouse, G. 3
- Silurian-Devonian: Fettke, C.R. 14

Maps
- Economic, oil and gas: Grow, G.C. 1
- Geologic: Leggette, R.M. 1
  - Pleistocene deposits: Leverett, F. 1
  - Pleistocene gravel: Leggette, R.M. 1
- Isopach
  - Second oil sand, Venango district: Sherrill, R.E. 7
  - Silurian: Rittenhouse, G. 3
  - Third stray sand, Venango district: Sherrill, R.E. 7
- Paleogeographic, buried Pleistocene valleys: Leggette, R.M. 1
- Physiographic, drainage changes: Carll, J.F. 3
- Structure contour
  - Helderberg limestone, Devonian: Carll: J.F. 9
  - Oriskany sandstone, Devonian: Fettke, C.R. 14
  - Second oil sand, Venango district: Sherrill, R.E. 7
  - Third stray sand, Venango district: Sherrill, R.E. 7
  - Trenton limestone, Ordovician: Fettke, C.R. 30

Paleontology
- amhibians, Devonian: Caster, K.E. 1
- arthropods, Devonian: Caster, K.E. 1
- brachiopods, Devonian-Mississippian: Caster, K.E. 1; Girty, G.H. 4
- cephalopods
  - Devonian: Flower, R.H. 1
  - Devonian-Mississippian: Caster, K.E. 1
- fish, Devonian-Mississippian: Caster, K.E. 1
- gastropods, Devonian-Mississippian: Caster, K.E. 1
- pelecypods
  - Devonian: Caster, K.E. 1, 10
  - Mississippian: Caster, K.E. 1
- sponges
  - Devonian-Mississippian: Caster, K.E. 1
  - Mississippian: Caster, K.E. 11
- trilobites, Devonian: Caster, K.E. 1

Petrology
- Venango oil sands, Devonian: Hershelman, W.L. 1

Physical geology
- minor folds: Decker, C.E. 1

Physiography
- drainage changes, Lake Erie area: Carll, J.F. 3; Spencer, J.W. 1
- glacial features: Leverett, F. 1
- glacial Lake Warren: Taylor, F.B. 1
- peneplains: Cole, W.S. 1

PENNSYLVANIA-SOUTHCENTRAL, *see also* Pennsylvania, Pennsylvania-Central, Pennsylvania-Eastern, Pennsylvania-Southeastern, Pennsylvania-Southwestern, Pennsylvania-Western, and individual counties

Economic geology
- copper: Ross, C.S. 2
- slate: Rogers, H.D. 4

Historical geology
- Cambrian-Devonian: Aiken, W.E.A. 1
- Ordovician, Blount group: Butts, C. 15

Physical geology
- quartz recrystallization and flowage: Fellows, R.E. 1
- structure, generalized: Aiken, W.E.A. 1

PENNSYLVANIA-SOUTHEASTERN, *see also* Pennsylvania, Pennsylvania-Eastern, and individual counties
- field trip review: Williams, G.H. 1
- historical accounts: Schoepf, J.D. 1
- soils, origin: Shaw, C.F. 1

Areal geology
- Blue Ridge: Stose, G.W. 34
- Great Valley: Johnson, D.W. 1
- Piedmont district: Bascom, F. 8
- Southeastern: Frazer, P. 31; Rand, T.D. 27; Rolfe, D. 1

Economic geology

- asbestos: Stone, R.W. 39
- barite: Stone, R.W. 39
- cement: Burchard, E.F. 1
- chromite: Fisher, L.E. 1
- clay: Hopkins, T.C. 4, 10; Ries, H. 3
- copper: Anon. 2; Frazer, P. 31; Wherry, E.T. 4
- corundum: Stone, R.W. 39, 47
- dolomite: Weitz, J.H. 1
- feldspar: Ashley, G.H. 24
- graphite: Miller, B.L. 4, 5
- iron: Anon. 2; Corbin, J.R. 7; Hopkins, T.C. 7; Newhouse, W.H. 1; Rogers, H.D. 5; Whittlesey, C. 2; Willis, B. 1
  - popular: Foose, R.M. 15
- lead: Anon. 2; Talmage, S.B. 1
- marble: Anon. 2
- mineral resources: Rogers, H.D. 4
- natural gas: Ashley, G.H. 14; Carter, O.C.S. 7
- petroleum: Ashley, G.H. 14; Carter, O.C.S. 7
- potash: Stone, R.W. 47
- quartz: Stone, R.W. 47
- rutile: Stone, R.W. 39
- sand and gravel: Ward, F. 4
- slate: Bates, T.F. 3; Behre, C.H. 5
- stone: Hopkins, T.C. 1, 2
- uranium: Stone, R.W. 47
- vermiculite: Stone, R.W. 39, 47
- zinc: Anon. 2; Frazer, P. 31; Freeman, L. 1; Talmage, S.B. 1

Ground water

- early drilling: Disbrow, L. 1
- Southeastern: Hall, G.M. 1
  - general: Carter, O.C.S. 4

Historical geology

- Cambrian: Miller, B.L. 23; Rogers, W.B. 6; Walcott, C.D. 2, 3, 6; Willard, B. 69
  - resemblance to Scotland: Stose, G.W. 33
- Cambrian-Ordovician: Foerste, A.F. 1; Hunt, T.S. 11; Mathews, E.B. 1; Stose, G.W. 9; Ulrich, E.O. 3; Walcott, C.D. 8; Wherry, E.T. 5
  - shale: Stose, G.W. 16
- Cambrian-Triassic: Rogers, H.D. 3
- Canadian: Ulrich, E.O. 3
- Cretaceous: McGee, WJ 2; Miller, B.L. 23; White, C.A. 1
- Ordovician: Miller, B.L. 17, 22; Walcott, C.D. 1; Willard, B. 3, 44
  - Allentown limestone: Buie, B.F. 1
  - Martic overthrust: Stose, G.W. 45
  - Martinsburg Formation: Behre, C.H. 6; Frazer, P. 18; Hintze, F.F. 1; Stose, G.W. 24
  - Martinsburg limestone: Miller, R.L. 1
  - overlap: Stose, G.W. 19
  - shales: Willard, B. 50
  - Taconic sequence: Stose, G.W. 44
- Ordovician-Devonian, Harrisburg axis: Willard, B. 57
- Ozarkian: Ulrich, E.O. 3
- Paleozoic: Woodward, H.P. 1
- Precambrian: Hitchcock, C.H. 8; Hopkins, T.C. 3; Hunt, T.S. 2, 7, 8, 10; Jonas, A.I. 4; Knopf, E.F.B. 2; Lesley, J.P. 67; Martin, D.S. 1; Mathews, E.B. 1; Miller, B.L. 22; Miller, W.J. 1; Platt, F. 16; Rogers, H.D. 25, 26; Steidtman, E. 1; Van Hise, C.R. 1, 2; Watson, E.H. 1; Whitney, J.D. 1; Williams, G.H. 5
  - limestone: Mitman, C.W. 1
  - popular: Leeds, A.R. 6
  - Reading Prong: Barrell, J. 2
  - sedimentary rocks: Wherry, E.T. 22
- Precambrian-Cambrian: Frazer, P. 32
- Precambrian-Ordovician: Hall, C.E. 6; Hawkins, A.C. 2; Rogers, H.D. 4; Swartz, F.M. 21
  - Piedmont district: Bascom, F. 8
- Precambrian-Paleozoic, historical development: Hunt, T.S. 9
- Precambrian-Triassic: Frazer, P. 31; Rand, T.D. 27; Schuchert, C. 23; Watson, E.H. 2
- Taconic: Hunt, T.S. 11
- Tertiary: Dall, W.H. 1; McGee, WJ 2
  - Bryn Mawr gravel: Bascom, F. 15
- Triassic: Carlston, C.W. 1; Cope, E.D. 2; Dorsey, G.E. 1; Finch, F. 2; Frazer, P. 22; Gilbert, G.K. 1; Hobbs, W.H. 2; Huene, F. von 2; Lea, I. 7; Lesley, J.P. 67; Lewis, H.C. 38; Lyman, B.S. 6; Newberry, J.S. 7; Russell, I.C. 1; Ver Wiebe, W.A. 8; Wherry, E.T. 9, 12, 13
  - border conglomerate: McLaughlin, D.B. 1
  - considered Permian: Lea, I. 13
  - glaciation: Wherry, E.T. 13
  - Lockatong Formation: Hawkins, A.C. 1
  - thickness: McLaughlin, D.B. 1

Maps

- Economic, brownstone: Hopkins, T.C. 2
- Geologic: Hall, C.E. 6, Hall, G.M. 1; Walcott, C.D. 8
  - Chester Valley, sketch: Mackin, J.H. 3
  - dikes: Lewis, H.C. 38
  - Newark basin: Carlston, C.W. 1
  - road-log strips: Stose, G.W. 32

    Triassic: Lyman, B.S. 6
  Soil: Shaw, C.F. 1

Mineralogy
  albite: Rose, G. 1
  allanite: Stone, R.W. 47
    weathering products: Watson, T.L. 3
  aquacreptite: Lewis, H.C. 22
  crocidolite: Wherry, E.T. 27
  epidote: Stone, R.W. 47
  glauberite: Wherry, E.T. 18
  heavy minerals
    key: Dryden, A.L. 3
    Wissahickon schist: Dryden, A.L. 5
  hypersthene: Claven, W. 1
  mica: Silliman, B., Jr. 6
  mineral locations: Eyerman, J. 3; Gordon, S.G. 12; Leonhard, G. 1; Seybert, A. 2
  radioactive minerals: Wherry, E.T. 3

Paleontology
  Cambrian fauna: Resser, C.E. 2; Walcott, C.D. 2
  graptolites, paleogeography: Moore, R.C. 1
  plants, Triassic: Ward, L.F. 2, 3; Wherry, E.T. 11
  pterodactyl, Triassic: Cope, E.D. 2
  reptile, Triassic: Cope, E.D. 7
  worms, Cambrian: James, J.F. 1

Petrology
  andesite: Bascom, F. 20
  anorthosite: Bascom, F. 20
  basalt: Bascom, F. 20
  crystalline rocks: Hunt, T.S. 2
  diabase: Hotz, P.E. 1; Lewis, H.C. 38; Ryan, J.D. 2; Stephenson, T.E. 1; Tomlinson, W.H. 6; Wherry, E.T. 10
  dolomite: Chamberlin, D.S. 1
  gabbro: Bascom, F. 20
  gneiss: Bascom, F. 11; Fraser, D.M. 14; Hunt, T.S. 7, 10
  granodiorite: Bascom, F. 20
  heavy minerals, provenance: Dryden, A.L. 2
  igneous rocks: Bascom, F. 12, 19, 20; Lesley, J.P. 67
  latite: Bascom, F. 20
  limestone, insoluble residue: Hills, J.M. 3
  metamorphic rocks: Hietanen, A.M. 2; Lesley, J.P. 67; Watson, E.H. 1
  metamorphosed sediments, Precambrian: Wherry, E.T. 22
  pegmatite, Reading Prong, Precambrian-Cambrian: Fraser, D.M. 15
  peridotite, relation to orogeny: Hess, H.H. 1
  pyroxenite: Bascom, F. 20
  quartz diorite: Bascom, F. 20
  quartz gabbro: Bascom, F. 20
  quartz latite: Bascom, F. 20
  quartz monzonite: Bascom, F. 20
  rhyodacite: Bascom, F. 20
  schists: Hunt, T.S. 7, 10; Keyes, C.R. 3
  serpentine: Hunt, T.S. 13, 15; Jonas, A.I. 1; Rand, T.D. 18, 23; Schrauf, A. 2
  slates: Hunt, T.S. 7
  volcanic rocks: Jonas, A.I. 13; Williams, G.H. 5
  Wissahickon schist: Bell, J. 1

Physical geology
  Appalachian Mtns., original height: Lesley, J.P. 24
  crustal shortening, axial trends: Cloos, E. 1
  Delaware River, preglacial course: Miller, R.L. 3
  faults
    Martic overthrust: Bailey, E.B. 2; Mackin, J.H. 3; Miller, B.L. 22
      klippen: Kay, G.M. 2
    post-Cretaceous: Stose, G.W. 25
    thrusts: Keith, A. 4
  folding
    Ordovician: Miller, B.L. 17
    Precambrian: Miller, W.J. 1
  quartz recrystallization and flowage: Fellows, R.E. 1
  structure
    Allentown limestone: Hills, J.M. 2
    basement compex: Cloos, E. 7
    Piedmont: Bascom, F. 16
    Piedmont-Blue Ridge: Jonas, A.I. 9

Physiography
  Bryn Mawr gravel: Lewis, H.C. 14
  drainage patterns, age: Bascom, F. 6
    Triassic influence: Meyerhoff, H.A. 1
  erosion surfaces: Hickok, W.O. 5; Knopf, E.F.B. 3
    Somerville surface: Ward, F. 5
  glacial features: Williams, E.H. 5
    Delaware Valley: Wright, A.A. 1
    south of terminal moraine: Lewis, H.C. 36
  Great Valley: Brigham, A.P. 1
  peneplains: Bartlett, R.L. 1; Bascom, F. 14; Dryden, A.L. 1; Knopf, E.F.B. 3; Ver Steeg, K. 12
    faulted: Stose, G.W. 25
    warped: Campbell, M.R. 14
  Piedmont: Bascom, F. 16
  Reading Prong: Olmstead, E.W. 1
  terraces: Bascom, F. 14; Dryden, A.L. 1
    Delaware River: Winchell, H.N. 1
    Piedmont: Wallace, D.M. 1

PENNSYLVANIA-SOUTHWESTERN, *see also* Pennsylvania, Pennsylvania-Western, and individual counties
- *Areal geology*
  - Southwestern: Hildreth, S.P. 1
- *Economic geology*
  - clay: Leighton, H. 5; Pechin, E.C. 1; Stone, R.W. 9
  - coal, bituminous: Abernathy, G.E. 1; Burroughs, W.G. 2; D'Invilliers, E.V. 9; Hildreth, S.P. 1; Pechin, E.C. 1; Pomeroy, S.W. 1; Stevenson, J.J. 2; Stone, R.W. 10; Theissen, R. 2; White, I.C. 23, 29
  - iron: Pechin, E.C. 1; Stone, R.W. 14
  - limestone: Clapp, F.G. 1; Pechin, E.C. 1
  - mineral resources: Rogers, H.D. 4
  - natural gas: Munn, M.J. 1
  - petroleum: James, J.R. 1; Jillson, W.R. 1; Matteson, L.S. 1; Munn, M.J. 1
    - deep drilling: White, I.C. 27
    - dry sands: Reeves, F. 1
    - relation to structure: Clapp, F.G. 7
  - sandstone: Stone, R.W. 14
  - shale: Leighton, H. 5; Stone, R.W. 9
- *Ground water*
  - Southwestern: Piper, A.M. 1
- *Historical geology*
  - Devonian: Bayles, R.E. 1; James, J.R. 1; Stevenson, J.J. 7
    - Chemung Formation: Willard, B. 14
  - Devonian-Mississippian: Caster, K.E. 7; Laird, W.M. 2
  - Devonian-Pennsylvanian: Matteson, L.S. 1; Robinson, J.F. 4
  - Devonian-Permian: Hice, R.R. 7
  - Mississippian: Pepper, J.F. 1, 2
    - Greenbrier limestone: Rittenhouse, G. 4
  - Mississippian-Permian: Aiken, W.E.A. 1
  - Ordovician-Mississippian: Butts, C. 8
  - Paleozoic: Lafferty, R.C. 1
  - Pennsylvanian: Case, E.C. 2; D'Invilliers, E.V. 9; Hildreth, S.P. 1; Stevenson, J.J. 2; White, I.C. 1
    - Mercer group: White, C.D. 6
    - Pittsburgh coal: D'Invilliers, E.V. 9; Fieldner, A.C. 4; Gresley, W.S. 4; White, I.C. 29
    - unconformities: Sherrill, R.E. 2
  - Pennsylvanian-Permian: Beede, J.W. 1; Case, E.C. 3; Stone, R.W. 15
  - Permian: Case, E.C. 2; La Forge, L. 1; Lesley, J.P. 67; Moore, R.C. 4; Stewart, P.R. 1; Williams, H.S. 6
  - Silurian-Pennsylvanian: Rogers, H.D. 3
- *Maps*
  - Economic, petroleum and gas: Hice, R.R. 8; Munn, M.J. 1, 6; Pepper, J.F. 1, 2
  - Geologic: Carll, J.F. 7; Clapp, F.G. 1; Hice, R.R. 7; Leighton, H. 5; Piper, A.M. 1
  - Isopach
    - Devonian sands: Matteson, L.S. 1
    - Mississippian, Berea sandstone: Pepper, J.F. 1
    - Mississippian sands: Matteson, L.S. 1; Pepper, J.F. 2
    - Pennsylvanian sands: Matteson, L.S. 1
    - Permian: Ver Wiebe, W.A. 7
  - Structure: Hice, R.R. 7
  - Structure contour, Pittsburgh coal: Munn, M.J. 6; Stone, R.W. 16
- *Paleontology*
  - amphibians, Permian: Burke, J.J. 2
  - Devonian-Pennsylvanian faunas: Stevenson, J.J. 5
  - Pennsylvanian fossil localities: Raymond, P.E. 3
  - plants, Permian: Fontaine, W.M. 1; White, C.D. 9
  - reptiles, Permian: Burke, J.J. 2
- *Petrology*
  - coal, bituminous: Theissen, R. 2
    - Pittsburgh coal: Fieldner, A.C. 4
      - partings: Gresley, W.S. 4
  - sandstones, dry: Reeves, F. 1
  - Waynesburg sandstone: Miller, D.J. 1
- *Physical geology*
  - mass movement: Sharp, C.F.S. 1
  - structure: Hice, R.R. 7; Lafferty, R.C. 1; Stevenson, J.J. 5; Stone, R.W. 16
    - control of petroleum: Clapp, F.G. 7
    - trends, Ohio Valley: Gardner, J.H. 2
- *Physiography*
  - benches: Stevenson, J.J. 6
  - drainage changes: Stone, R.W. 12
  - high-level gravel: White, I.C. 16
  - peneplains: Fridley, H.M. 2; Stone, R.W. 12
  - peneplains: Fridley, H.M. 2; Stone, 12

PENNSYLVANIA-WESTERN, *see also* Pennsylvania, Pennsylvania-Northwestern, Pennsylvania-Southwestern, and individual counties
- engineering geology, dam design and cyclothems: Philbrick, S.S. 2
- *Economic geology*
  - cement: Ashley, G.H. 40
  - clay: Ashley, G.H. 40; Hice, R.R. 3; Hopkins, T.C. 4

coal, bituminous : Adams, T.K. 1, 2 ; Ashley, G.H. 40, 67 ; Bryan, P.W. 1 ; Caddell, H.M. 1 ; Campbell, M.R. 5 ; Cooper, H.M. 2 ; Heurteau, C.E. 1 ; Hosler, R.N. 1 ; Lesley, J.P. 67 ; Ramsey, G.S. 1 ; Rogers, H.D. 8 ; Seddon, W. 1 ; Sisler, J.D. 24 ; Stadnichenko, T.M. 1 : Stevenson, J.J. 1 ; Theissen, R. 1, 3 ; White, C.D. 5 ; White, I.C. 21 ; Whittlesey, C. 3
  analyses : Campbell M.R. 9 ; Cooper, H.M. 1 ; Fieldner, A.C. 1, 2 ; Johnson, W.R. 5 ; McCreath, A.S. 1, 3, 5
  general : Ashley, G.H. 38 ; Campbell, M.R. 13
  oil-bearing : Ashley, G.H. 26
  origin : Ashley, G.H. 20
  reserves : Ashley, G.H. 18 ; Chance, H.M. 12 ; Reese, J.F. 1, 12 ; Sisler, J.D. 21
  stratigraphic locations : White, I.C. 18
coal, cannel : Ashley, G.H. 11, 12 ; Fettke, C.R. 4
coal, splint : Sprunk, G.C. 1
fire clay : Leighton, H. 4 ; Morganroth, L.C. 2
  analyses : McCreath, A.S. 1
iron : Ashley, G.H. 40
limestone : Ashley, G.H. 40 ; Stone, R.W. 11
mineral resources : Von Bernewitz, M.W. 1
natural gas : Ashburner, C.A. 39 ; Ashley, G.H. 17, 29, 40 ; Bownocker, J.A. 1, 2 ; Campbell, M.R. 5 ; Carll, J.F. 6, 7 ; Chance, H.M. 15 ; Clapp, F.G. 9, 11, 13 ; Demarest, D.F. 1 ; Finn, F.H. 1 ; Lesley, J.P. 52, 67 ; Moyer, W.I. 1 ; Munn, M.J. 8 ; Postley, O.C. 1 ; Sisler, J.D. 28 ; White, I.C. 15
  analyses : Hickok, W.O. 3
  bibliography : Cathcart, S.H. 14
  examples of occurrence : Ashburner, C.A. 37
  geochemistry : Price, P.H. 5
  reserves : Ashley, G.H. 27
  well logs : Platt, F. 2
oil shale : Ashley, G.H. 11
petroleum : Andrews, E.B. 2 ; Arnold, R. 1 ; Ashburner, C.A. 7, 15, 38 ; Ashley, G.H. 22, 29, 40 ; Billingsley, J.E. 1 ; Boyd, C.R. 1 ; Brannt, W.T. 1 ; Burkhart, H.J. 1 ; Burroughs, W.G. 1 ; Caddell, H.M. 1 ; Campbell, M.R. 5 ; Carll, J.F. 5, 7, 9 ; Claus, C.R. 1 ; Credner, H. 1 ; Daddow, S.H. 1 ; Daly, M. 1, 2 ; Day, D.T. 2 ; Demarest, D.F. 1 ; Gesner, A. 1 ; Grabau, A.W. 13 ; Heck, E.T. 2 ; Hitchcock, C.H. 3 ; Hunt, T.S. 1 ; Johnson, R.H. 1 ; Leeds, A.R. 1 ; Lesley, J.P. 8, 9, 67 ; Lilley, E.R. 1 ; Majorelle, J. 1 ; Munn, M.J. 8 ; Myers, T.H. 1 ; Otsuka, S. 1 ; Peckham, S.F. 1 ; Plotts, W. 1, 3 ; Reger, D.B. 2 ; Remick, D.B. 1 ; Sherrill, R.E. 8 ; Sisler, J.D. 28 ; Swartz, F.M. 19 ; Torrey, P.D. 5 ; Ver Wiebe, W.A. 5, 6, 9 ; Vicaire, A. 1 ; Wrigley, H.E. 1
  analyses : Hickok, W.O. 3
  bibliography : Burroughs, E.H. 1 ; Cathcart, S.H. 14
  connate water : Torrey, P.D. 4
  deep wells : White, I.C. 26
  generalized : Fuller, M.L. 10
  history : Goodrich, H.B. 1
  limiting factors : Ashley, G.H. 62
  mining : Dickey, P.A. 1 ; Torrey, P.D. 1
  1922 development : Johnson, M.E. 5
  origin : Andrews, E.R. 1 ; Day, D.T. 1, 4
  popular : Anon. 43, 46, 50 ; Gale, T.A. 1 ; Newberry, J.S. 9
  porosity control : Krynine, P.D. 11
  relation to gas composition : Price, P.H. 5
  relation to structure : Clapp, F.G. 8
  reserves : Ashley, G.H. 27 ; Wrigley, H.E. 3
pyrite : Ashley, G.H. 40 ; Leighton, H. 1
salt : Ashley, G.H. 40 ; Stone, R.W. 44, 47
  popular : Anon. 54
sand and gravel : Ashley, G.H. 40
sandstone : Ashley, G.H. 40
shale : Ashley, G.H. 40
sulphur, from pyrite in coal : Leighton, H. 2

Ground water
general : Leggette, R.M. 2
oil-field water, analyses : Barb, C.F. 2
saline, oil wells : Richardson, G.B. 4

Historical geology
Cambrian-Pennsylvanian : Bownocker, J.A. 1 ; Rogers, H.D. 4
Devonian : Ashburner, C.A. 23 ; Bennett, J. 1 ; Hoffacker, B.F. 1 ; Sherrill, R.E. 3
Devonian-Mississippian : Carll, J.F. 7 ; Caster, K.E. 6, 12 ; Day, D.T. 2 ; Lesley, J.P. 9 ; Ver Wiebe, W.A. 1
Devonian-Pennsylvanian : Ashburner, C.A. 7 ; Carll, J.F. 9 ; Lesley, J.P. 8 ; Majorelle, J. 1 ; Otsuka, S. 1 ; Sisler, J.D. 26, 28
Devonian-Permian : Ashburner, C.A. 15

- Jurassic-Recent: Gibson, J.B. 2
- Mississippian: Demarest, D.F. 1; Rittenhouse, G. 1; Stevenson, J.J. 10
  - Loyalhanna limestone: Butts, C. 14
- Mississippian-Pennsylvanian: Marten, P.F. 1; Savage, T.E. 1
- Ordovician: Kay, G.M. 6; Rittenhouse, G. 6
- Ordovician-Devonian: Fettke, C.R. 22
- Ordovician-Mississippian: Martens, J.H. 2
- Ordovician-Pennsylvanian: Fettke, C.R. 26; Martens, J.H. 1
- Paleozoic: Johnson, R.H. 1; Swartz, F.M. 18; Ver Wiebe, W.A. 5
  - Appalachian basin: Ashley, G.H. 9
  - facies relations: Ashley, G.H. 62
- Pennsylvanian: Adams, T.K. 1, 2; Campbell, M.R. 5; Ramsay, G.S. 1; Renick, B.C. 1; Ries, H. 1; Rogers, H.D. 3; Stevenson, J.J. 1; White, I.C. 4; Whitney, J.D. 1; Whittlesey, C. 3
  - Allegheny Formation: Swartz, C.K. 1; White, C.D. 2
  - Brush Creek limestone: Seaman, D.M. 4
  - Cambridge limestone: Seaman, D.M. 3
  - Monongahela Formation: Ashley, G.H. 43
  - Pittsburgh coal: White, I.C. 21
  - Pottsville conglomerate: Chance, H.M. 8
- Pennsylvanian-Permian: Ashley, G.H. 38; Heurteau, C.E. 1; Lesley, J.P. 38; Sisler, J.D. 21, 27; White, C.D. 5
- Silurian: Rittenhouse, G. 5
- Silurian-Devonian: Ashley, G.H. 22; Fettke, C.R. 15, 21
- Silurian-Pennsylvanian: Ashley, G.H. 51; Rittenhouse, G. 2

Maps

- Economic
  - coal, bituminous: Halberstadt, B. 1
    - Lower Freeport coal: Sisler, J.D. 27
    - Lower Kittanning coal: Sisler, J.D. 27
    - Pittsburgh coal: Sisler, J.D. 27
  - petroleum: Carll, J.F. 5, 9; Myers, T.H. 1; Wrigley, H.E. 1
  - petroleum and gas: Ashley, G.H. 29; Averitt, P. 2; Carl, J.F. 7; Day, D.T. 3, 5; Demarest, D.F. 1; Northrop, J.D. 1; Pierce, W.G. 1; Republic Explor. Co. 1; Richardson, G.B. 5, 6, 10; Sisler, J.D. 29
  - sulphur from pyrite: Leighton, H. 2
- Geologic: Sayler, N. 1; White, I.C. 18
  - Catskill red beds: Carll, J.F. 9
- Isopach
  - Mississippian sands: Demarest, D.F. 1
  - Queenston shale, Ordovician: Rittenhouse, G. 6
  - Vanport limestone, Pennsylvanian: Swain, F.M. 2
- Isovol, petroleum and gas: Cathcart, S.H. 7
- Structural: Grow, G.C. 1; Postley, O.C. 2
- Structure contour
  - Oriskany sandstone, Devonian: Fettke, C.R. 19, 26
  - Pittsburgh coal: Ashley, G.H. 29
  - Pittsburgh-Huntingdon basin: Richardson, G.B. 7

Mineralogy

- barium in brines: Heck, E.T. 1
- pyrite in coal: Brown, A.P. 1

Paleontology

- cephalopods, Pennsylvanian: Miller, A.K. 5
- fish, Pennsylvanian: Leidy, J. 1
- Pennsylvanian: Raymond, P.E. 4
  - Ames limestone: Seaman, D.M. 2
  - Brush Creek limestone: Seaman, D.M. 4
  - Cambridge limestone: Seaman, D.M. 3
- plants, Pennsylvanian: Kimball, J.P. 1; White, C.D. 2
- sponges, Devonian: Caster, K.E. 11

Petrology

- Berea sandstone, Mississippian: Rittenhouse, G. 1
- clay veins in coal: Gresley, W.S. 7
- coal, bituminous: Marshall, C.E. 1, 2; Selvig, W.A. 1; Theissen, R. 1, 3
- Paleozoic sediments, source: Krynine, P.D. 3
- sandstones, texture: Rittenhouse, G. 2
- shales, Pennsylvanian: Emery, A.H. 1

Physical geology

- folding, Devonian: Sherrill, R.E. 3
- folds, foreland: Sherrill, R.E. 1
- structure: Butts, C. 1; Campbell, M.R. 5
  - Pittsburgh basin: Richardson, G.B. 8
  - Pittsburgh-Huntingdon basin: Richardson, G.B. 7
- structural axes: Torrey, P.D. 3
- structural maps, bibliography: Postley, O.C. 2

Physiography

- drainage changes: Hice, R.R. 4; Leverett, F. 4; Shaw, E.W. 5
  - Beaver River, Pleistocene: Hice, R.R. 2

    - Ohio basin: Chamberlin, T.C. 5
    - Ohio River: Leverett, F. 7
    - Spencer River: Foshay, P.M. 2
  - glacial border: Williams, E.H. 7; Wright, G.F. 7
  - glacial erosion and oxidation: Wright, G.F. 13
  - glacial extramorainic pebbles: Woolsey, L.H. 2
  - glacial grooves, Beaver River: Foshay, P.M. 1
  - glacial Lake Monongahela: Hice, R.R. 2
  - peneplains: Rich, J.L. 1; Ver Steeg, K. 10
  - popular: Arthur, E.W. 1
  - potholes, Beaver River: Hice, R.R. 2
  - terraces: Shaw, E.W. 5
    - Beaver River: Hice, R.R. 1; King, A.T. 6
    - Monongahela River: White, I.C. 19
    - Ohio River: King, A.T. 6
    - origin: Chamberlin, T.C. 1
    - Upper Ohio River: Hice, R.R. 1

PENNSYLVANIAN, *see also* Paleozoic
  - Allegheny Co.: Anon. 29; Darrah, W.C. 2; D'Invilliers, E.V. 6; Grabau, A.W. 2; Ingham, A.I. 2; Jillson, B.C. 1; Lesley, J.P. 56; Myers, C.K. 1; Newmeyer, A.J. 1; Raymond, P.E. 1; Stevenson, J.J. 4, 5; White, I.C. 20
    - Beaver quadrangle: Woolsey, L.H. 3, 4
    - Brownsville quadrangle: Campbell, M.R. 2
    - Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
    - Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
    - Conemaugh Formation: Anon. 29
    - New Kensington quadrangle: Richardson, G.B. 9
    - northern: White, I.C. 6
    - Pittsburgh area: Leighton, H. 8
      - popular: Leighton, H. 3
    - Pittsburgh quadrangle: Johnson, M.E. 6, 9
    - Sewickley quadrangle: Munn, M.J. 5
    - southern: Stevenson, J.J. 3
    - Upper Freeport coal: Rayburn, J.M. 1
  - Armstrong Co.: Lesley, J.P. 11; Platt, W.G. 2
    - Brookville quadrangle: Graeber, C.K. 3
    - Clarion quadrangle: Shaw, E.W. 4
    - Elders Ridge quadrangle: Stone, R.W. 3, 5
    - Foxburg quadrangle: Butts, C. 3
    - Kittanning quadrangle: Butts, C. 3
    - Rural Valley quadrangle: Butts, C. 5
    - Smicksburg quadrangle: Shaffner, M.N. 2, 3
    - stream courses: Blandy, J.F. 1
  - Beaver Co.: White, I.C. 3, 6
    - Beaver quadrangle: Woolsey, L.H. 3, 4
    - Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
    - New Castle quadrangle: De Wolf, F.W. 1
    - Sewickley quadrangle: Munn, M.J. 5
    - southern: Stevenson, J.J. 3; White, I.C. 2
    - Zelienople quadrangle: Richardson, G.B. 12
  - Bedford Co.: Lesley, J.P. 2; Miller, E. 1; Stevenson, J.J. 8; White, I.C. 14
    - Broadtop basin: Gardner, J.H. 1
    - Ebensburg quadrangle: Butts, C. 4
    - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
    - Windber quadrangle: Richardson, G.B. 11
  - Blair Co.: Butts, C. 13; Platt, F. 6, 15; White, C.D. 4; White, I.C. 14
    - Ebensburg quadrangle: Butts, C. 4
    - Hollidaysburg quadrangle: Butts, C. 20
    - Patton quadrangle: Campbell, M.R. 8
  - Bradford Co.: Torrey, P.D. 3
  - Butler Co.: Chance, H.M. 3, 4
    - Butler-Zelienople quadrangles: Richardson, G.B. 12
    - Foxburg quadrangle: Shaw, E.W. 2, 4
    - Kittanning quadrangle: Butts, C. 3
    - New Kensington quadrangle: Richardson, G.B. 9
    - Sewickley quadrangle: Munn, M.J. 5
    - southern: White, I.C. 6
    - Upper Freeort coal: Rayburn, J.M. 1
  - Cambria Co.: Miller, E. 1; Platt, F. 4; Swartz, F.M. 17
    - Barnesboro-Patton quadrangles: Campbell, M.R. 8
    - Ebensburg quadrangle: Butts, C. 4
    - Johnstown quadrangle: Phalen, W.C. 3, 4
    - Windber quadrangle: Richardson, G.B. 11
  - Cameron Co.: Ashburner, C.A. 28; Cathcart, S.H. 10
  - Carbon Co.: Ashburner, C.A. 24; Winslow, A. 2
    - Eastern Middle anthracite field: Ashburner, C.A. 18
    - Jim Thorpe area: Silliman, B. 3
    - Panther Creek Valley: Ashburner, C.A. 2; Richards, W.B. 1
  - Central: Willard, B. 46
  - Centre Co.: D'Invilliers, E.V. 4; Taylor, R.C. 1

  - Bellefonte quadrangle: Butts, C. 16
- Clarion Co.: Chance, H.M. 6
  - Brookville quadrangle: Graeber, C.K. 2, 3
  - Clarion quadrangle: Munn, M.J. 3
  - Clarion-Foxburg quadrangles: Lines, E.F. 2; Shaw, E.W. 4
  - Kittanning quadrangle: Butts, C. 3
  - Oil City quadrangle: Dickey, P.A. 4
  - Rural Valley quadrangle: Butts, C. 5
- Clearfield Co.: Ashley, G.H. 48; Chance, H.M. 14; Hale, J.M. 1; Kemp, J.F. 4
  - Allegheny Formation: Platt, F. 1
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Curwensville quadrangle: Ashley, G.H. 68
  - Punxsutawney quadrangle: Ashley, G.H. 33
- Clinton Co.: Chance, H.M. 1, 2, 7; Leeds, S.P. 1; Ulmer, L.J. 1
  - Renovo basin: Ashburner, C.A. 13
- Crawford Co.: White, I.C. 9
- Dauphin Co.: Willard, B. 46
  - Southern anthracite field: Ashburner, C.A. 18
- Elk Co.: Ashburner, C.A. 16, 28; Cathcart, S.H. 9; Jackson, C.T. 2
- Erie Co.: Torrey, P.D. 3; White, I.C. 9
- Fayette Co.: D'Invilliers, E.V. 6; Hickok, W.O. 10; Moyer, F.T. 2; Stevenson, J.J. 5
  - Accident-Grantsville quadrangles: Martin, G.C. 3
  - Brownsville-Connelsville quadrangles: Campbell, M.R. 2
  - Ligonier Valley: Stevenson, J.J. 5
  - Masontown-Uniontown quadrangles: Campbell, M.R. 1
  - Waynesburg quadrangle: Stone, R.W. 4
  - western: Stevenson, J.J. 4
- Forest Co.: Ashburner, C.A. 28, 29
  - Oil City quadrangle: Dickey, P.A. 4
  - Tidioute quadrangle: Cathcart, S.H. 13
- Fulton Co.: Stevenson, J.J. 8
  - Broadtop basin: Gardner, J.H. 1
- Greene Co.: Stone, R.W. 1, 8, 33; Stevenson, J.J. 3
  - Amity quadrangle: Clapp, F.G. 4, 6
  - Carnegie quadrangle: Munn, M.J. 7
  - Masontown-Uniontown quadrangles: Campbell, M.R. 1
  - Rogersville quadrangle: Clapp, F.G. 5
  - Waynesburg quadrangle: Stone, R.W. 4
- Huntingdon Co.: Ashburner, C.A. 3, 4, 6; Butts, C. 13; Lesley, J.P. 2; Miller, E. 1; White, I.C. 14
  - Broadtop basin: Gardner, J.H. 1
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Indiana Co.: Anderson, W. 1; Platt, W.G. 1
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - buried channel: Shaffner, M.N. 1
  - Elders Ridge quadrangle: Stone, R.W. 3, 5
  - Indiana quadrangle: Richardson, G.B. 2
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - Latrobe quadrangle: Campbell, M.R. 6
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - Smicksburg quadrangle: Shaffner, M.N. 2, 3
- Jefferson Co.: Ashburner, C.A. 28; Ferm, J.C. 1; Platt, W.G. 3
  - Allegheny Formation: Platt, F. 1
  - Brookvile coal: Foose, R.M. 5
  - Brookville quadrangle: Graeber, C.K. 2, 3
  - buried channel: Shaffner, M.N. 1
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - Smicksburg quadrangle: Shaffner, M.N. 2
- Lackawanna Co.: Gleason, F.A. 1; Hill, F.A. 1; Miller, B.L. 25; Sheafer, P.W. 5
  - Northern anthracite field: Ashburner, C.A. 18
- Lawrence Co.: Chance, H.M. 3; Lesley, J.P. 22; White, I.C. 5
  - New Castle area: Leasure, D. 1
  - New Castle quadrangle: De Wolf, F.W. 1
  - Zelienople quadrangle: Richardson, G.B. 12
- Lebanon Co., Southern anthracite field: Ashburner, C.A. 18
- Luzerne Co.: Darrah, W.C. 2; Gleason, F.A. 1; Hill, F.A. 10; Johnson, W.R. 11; Miller, B.L. 25; Sheafer, P.W. 6; Winslow, A. 2
  - anthracite fields: Ashburner, C.A. 18
  - Canal limestone: Ashburner, C.A. 35
  - Hillman limestone: Ashburner, C.A. 35
  - Mill Creek limestone: Ashburner, C.A. 35
  - Wilkes-Barre area: Cist, Z. 2
- Lycoming Co.: Sherwood, A. 2
- McKean Co.: Ashburner, C.A. 28; Cathcart, S.H. 8; Fettke, C.R. 24; Torrey, P.D. 3
- Mercer Co.: Chance, H.M. 3; Griswold, E. 1; White, I.C. 7

Monroe Co.: White, I.C. 11; Willard, B. 40
Northeastern: Ashburner, C.A. 19, 21, 25, 36; Ashley, G.H. 61; Austin, A.C. 1; Green, W. 1; Griffith, W. 4; Hill, F.A. 3; Lyell, C. 1; Rogers, H.D. 3, 5, 14; Seidl, E. 1
  original extent: Lyman, B.S. 14
  Pottsville Formation: Brainerd, J. 1
Northern: Cathcart, S.H. 10; Taylor, R.C. 5; Torrey, P.D. 3
Northumberland Co.: Willard, B. 46
  Western Middle anthracite field: Ashburner, C.A. 18
Northwestern: Carll, J.F. 2, 4; Fettke, C.R. 12; Girty, G.H. 1; Glenn, L.C. 1; Lesley, J.P. 51; Rogers, H.D. 3; Swartz, C.C. 1
  correlation with Ohio and New York: Lesley, J.P. 21
  Sharon conglomerate: White, I.C. 8
Pennsylvania: Ashley, G.H. 36, 46, 58, 67; Bevan, A.C. 1; Boyd, C.R. 1; Burrows, J.S. 2; Butts, C. 9, 19; Caddell, H.M. 1; Cheney, M.G. 1; Darrah, W.C. 5; Eaton, A. 2; Grabau, A.W. 3; Hitchcock, C.H. 1; Hopkins, T.C. 3; Jongmans, W.J. 1, 3, 5; Kay, G.M. 3; Keyes, C.R. 2; Lesley, J.P. 3, 67; Lesquereux, L. 2, 5, 7, 8; Levorsen, A.I. 1; Marcou, J. 3; Moore, R.C. 2, 3, 4, 5, 6; Rogers, H.D. 2, 10; Savage, T.E. 2; Schuchert, C. 3, 23; Simmersbach, B. 1; Stevens, R.P. 1, 2; Stevenson, J.J. 11, 20; Ulrich, E.O. 1; Ver Wiebe, W.A. 7; Vicaire, A. 1; Wanless, H.R. 1, 2, 3; Waterschoot van der Gracht, W.A.J.M. 1; Weaver, T. 1; White, C.D. 1, 8; White, I.C. 13; Whittlesey, C. 1; Williams, H.S. 6; Willis, B. 8
  catalog: Lesley, J.P. 57
  climate: White, C.D. 11
  coal origin: Willard, B. 66
  continental deposits: Willard, B. 55
  correlation of anthracite: Turner, H.G. 2
  nomenclature: Ashley, G.H. 28
  overlap: Grabau, A.W. 5
  Pottsville Formation: Branner, J.C. 1; Claypole, E.W. 22
  Pottsville-Pittsburgh boundary: Ashley, G.H. 84
Pike Co.: White, I.C. 11
Potter Co.: Cathcart, S.H. 5; Platt, F. 8; Torrey, P.D. 3
  East Fork-Wharton area: Ebright, J.R. 1
  Gaines quadrangle: Fuller, M.L. 4
Schuylkill Co.: Lyman, B.S. 4; Sheafer, P.W. 1; White, C.D. 3; Willard, B. 47
  Eastern Middle anthracite field: Ashburner, C.A. 18
  Moorea-New Boston area: Lyman, B.S. 2
  Panther Creek Valley; Ashburner, C.A. 2; Richards, W.B. 1
  Shippen-Wetherill coal tract: Lyman, B.S. 5
  Southern anthracite field: Ashburner, C.A. 18
  Western Middle anthracite field: Ashburner, C.A. 18
Somerset Co.: Fulton, J. 1; Hodge, J.T. 1; Kimball, J.P. 2; Johnson, W.R. 9
  Accident-Grantsville quadrangles: Martin, G.C. 3
  Johnstown quadrangle: Phalen, W.C. 3, 4
  Somerset-Windber quadrangles: Richardson, G.B. 11
Southwestern: Aiken, W.E.A. 1; Beede, J.W. 1; Case, E.C. 2, 3; D'Invilliers, E.V. 9; Hice, R.R. 7; Hildreth, S.P. 1; Lafferty, R.C. 1; Matteson, L.S. 1; Robinson, J.F. 4; Rogers, H.D. 3, 4; Stevenson, J.J. 2; Stone, R.W. 15; White, I.C. 1
  historical: Beede, J.W. 1
  Mercer group: White, C.D. 6
  Pittsburgh coal: D'Invilliers, E.V. 9; Gresley, W.S. 4; White, I.C. 29
  unconformities: Sherrill, R.E. 2
Sullivan Co.
  Bernice basin: Ashburner, C.A. 32
  Pottsville conglomerate: Lyman, B.S. 1
Susquehanna Co.: Torrey, P.D. 2; White, I.C. 10
  Northern anthracite field: Ashburner, C.A. 18
Tioga Co.: Ashley, G.H. 49; Cathcart, S.H. 6; Fettke, C.R. 17; Hardt, A. 1; Torrey, P.D. 3; White, I.C. 25
  Elkland-Tioga quadrangles: Fuller, M.L. 3
  Gaines quadrangle: Fuller, M.L. 4
Venango Co.: Ashburner, C.A. 28
  Foxburg quadrangle: Shaw, E.W. 2, 4
  Franklin quadrangle: Sherrill, R.E. 5
  Oil City quadrangle: Dickey, P.A. 4
Warren Co.: Randall, F.A. 1; Torrey, P.D. 3
  Tidioute quadrangle: Cathcart, S.H. 13
  Warren quadrangle: Butts, C. 11

Washington Co.: Anon. 11; D'Invilliers, E.V. 6; Emery, B. 1; Ingham, A.I. 2; Stevenson, J.J. 3; White, I.C. 24, 25
Amity quadrangle: Clapp, F.G. 4, 6
Brownsville quadrangle: Campbell, M.R. 2
Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
Burgettstown-Steubenville quadrangles: Griswold, W.T. 2
Carnegie quadrangle: Munn, M.J. 6, 7
Masontown quadrangle: Campbell, M.R. 1
Pittsburgh area: Leighton, H. 8
Pittsburgh quadrangle: Johnson, M.E. 9
Rogersville quadrangle: Clapp, F.G. 5
Waynesburg quadrangle: Stone, R.W. 4
Wayne Co.: Torrey, P.D. 3; White, I.C. 10
Northern anthracite field: Ashburner, C.A. 18
Western: Adams, T.K. 1, 2; Ashburner, C.A. 7, 15; Ashley, G.H. 38, 51; Bownocker, J.A. 1; Campbell, M.R. 5; Carll, J.F. 2, 9; Fettke, C.R. 26; Heurteau, C.E. 1; Lesley, J.P. 8, 38; Majorelle, J. 1; Martens, J.H. 1, 2; Norten, P.F. 1; Otsuka, S. 1; Ramsay, G.S. 1; Renick, B.C. 1; Ries, H. 1; Rittenhouse, G. 2; Rogers, H.D. 3; Savage, T.E. 1; Sisler, J.D. 21, 26, 27, 28; Stevenson, J.J. 1; White, C.D. 5; White, I.C. 4, 18; Whittlesey, C. 3; Ver Wiebe, W.A. 5
Allegheny Formation: Swartz, C.K. 1; White, C.D. 2
Brush Creek limestone: Seaman, D.M. 4
Cambridge limestone: Seaman, D.M. 3
Monongahela Formation: Ashley, G.H. 43
Pittsburgh coal: White, I.C. 21
Pottsville conglomerate: Chance, H.M. 8
Westmoreland Co.: Graban, A.W. 2; D'Invilliers, E.V. 6; Raymond, P.E. 1; Stevenson, J.J. 5; White, I.C. 25
Connellsville quadrangle: Campbell, M.R. 2
Johnstown quadrangle: Phalen, W.C. 3, 4
Latrobe quadrangle: Campbell, M.R. 6
Ligonier Valley: Stevenson, J.J. 5
New Kensington quadrangle: Richardson, G.B. 9
Pittsburgh area: Leighton, H. 8
Pittsburgh quadrangle: Johnson, M.E. 9
Somerset quadrangle: Richardson, G.B. 11
Upper Freeport coal: Rayburn, J.M. 1
western: Stevenson, J.J. 4
Wyoming Co.: Read, C.B. 1
boundary: Hill, F.A. 5
popular: Maxwell, V.L. 1

PERIDOTITE, *see also* Dikes, and Igneous rocks
Indiana Co.: Graeber, C.K. 1; Honess, A.P. 1, 2
Fayette Co.: Kemp, J.F. 7; Smith, L.B. 1
Gates mine, intrusion temperature: Sosman, R.B. 1
Greene Co.: Smith, L.B. 1
Southeastern, relation to orogeny: Hess, H.H. 1

PERMIAN, *see also* Paleozoic
Allegheny Co.
Brownsville quadrangle: Campbell, M.R. 2
Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
Carnegie quadrangle: Shaw, E.W. 3
Beaver Co.: Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
Bedford Co., Broadtop basin: Gardner, J.H. 1
Fayette Co.: Hickok, W.O. 10
Waynesburg quadrangle: Stone, R.W. 4
Fulton Co., Broadtop basin: Garner, J.H. 1
Greene Co.: Stone, R.W. 8, 33
Amity quadrangle: Clapp, F.G. 6
Claysville quadrangle: Munn, M.J. 7
Rogersville quadrangle: Clapp, F.G. 5
Waynesburg quadrangle: Stone, R.W. 4
Huntingdon Co., Broadtop field: Gardner, J.H. 1
Southwestern: Aiken, W.E.A. 1; Ashburner, C.A. 15; Ashley, G.H. 38; Beede, J.W. 1; Butts, C. 19; Case, E.C. 2, 3; Darrah, W.C. 5; Eaton, A. 2; Heurteau, C.E. 1; Hice, R.R. 7; Hopkins, T.C. 3; Kay, G.M. 3; Lafferty, R.C. 1; LaForge, L. 1; Lesley, J.P. 38, 67; Lesquereux, L. 5; Moore, R.C. 2, 4; Schuchert, C. 3, 23; Sisler, J.D. 21, 27; Stevens, R.P. 2; Stevenson, J.J. 20; Stewart, P.R. 1; Stone, R.W.

15; Ulrich, E.O. 1; Ver Wiebe, W.A. 5, 7; Vicaire, A. 1; Waterschoot van der Gracht, W.A.J.M. 1; White, C.D. 5; White, I.C. 18; Williams, H.S. 6; Willis, B. 8
catalog: Lesley, J.P. 57
climate: White, C.D. 11
continental deposits: Willard, B. 55
historical: Beede, J.W. 1
Washington Co.
Amity quadrangle: Clapp, F.G. 6
Brownsville quadrangle: Campbell, M.R. 2
Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
Burgettstown-Steubenville quadrangles: Griswold, W.T. 2
Carnegie quadrangle: Munn, M.J. 6
Claysville quadrangle: Munn, M.J. 7
Rogersville quadrangle: Clapp, F.G. 5
Waynesburg quadrangle: Stone, R.W. 4

PERRY COUNTY, *see also* Pennsylvania, and Pennsylvania-Central

Areal geology
Perry Co.: Claypole, E.W. 16

Economic geology
coal, bituminous, Devonian: Taylor, R.C. 7
iron: Claypole, E.W. 16
paint ore: Claypole, E.W. 16
sand: Claypole, E.W. 16

Ground water
springs, popular: Stone, R.W. 54

Historical geology
Devonian: Willard, B. 67
Catskill Formation: Claypole, E.W. 6
Chemung Formation: Willard, B. 14
Cordiola shale: Claypole, E.W. 11
Hamilton sandstone: Claypole, E.W. 12
Kingsmill sandstone: Claypole, E.W. 5
Oriskany sandstone: Willard, B. 4
Schoharie equivalent: Claypole, E.W. 4
Ordovician-Mississippian: Willard, B. 33
Ordovician-Triassic: Claypole, E.W. 16

Maps
Geologic: Claypole, E.W. 16; Dewees, J.H. 2; Lesley, J.P. 46, 47

Paleontology
brachiopods, Devonian: Claypole, E.W. 8; Rafinesque, C.S. 1
branchiopods, Devonian, Moscow shale: Cleaves, A.B. 1
Devonian
Catskill fauna: Claypole, E.W. 6
Chemung Formation: Willard, B. 14
Hamilton coral reef: Willard, B. 30
fish, Silurian: Bryant, W.L. 1; Claypole, E.W. 9, 13, 18
fossil collecting localities: Claypole, E.W. 23
ostracodes, Silurian-Devonian: Jones, T.R. 3
plants, Devonian: Harlan, R. 3; Taylor, R.C. 7
Silurian fauna: Claypole, E.W. 10, 26
sponge, Devonian: Howell, B.F. 8
worms, Silurian: Howell, B.F. 9

Petrology
diabase, Triassic: Claypole, E.W. 16

Physical geology
concretions, calcareous: Roddy, H.J. 4
folding: Claypole, E.W. 14
New Bloomfield fault: Claypole, E.W. 15
New Germany fault: Claypole, E.W. 15
reverse faults, section thickening: Cloos, E. 4
structure: Claypole, E.W. 16
Cove Mtn.: Seltzer, G.S. 1
New Bloomfield quadrangle: Cleaves, A.B. 2

PETROFABRICS
Lancaster-York Cos., Martic thrust area: Cloos, E. 3
Lehigh Co., slate: Behre, C.H. 7
Pennsylvania: Cloos, E. 2; Hietanen, A.M. 1, 2
Southeastern, Blue Ridge area: Cloos, E. 6
Southeastern-Southcentral, quartzite recrystallization and flow: Fellows, R.E. 1

PETROLEUM
Allegheny Co.: Cummins, A. 1; Ingham, A.I. 2
Beaver quadrangle: Woolsey, L.H. 3, 4
Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
Freeport quadrangle: Hughes, H.H. 1
McDonald oil field: Ingham, A.I. 3
New Kensington quadrangle: Richardson, G.B. 9
Pittsburgh quadrangle: Johnson, M.E. 4, 9
reservoir sands: Johnson, M.E. 6
popular: Leighton, H. 3
Sewickley quadrangle: Munn, M.J. 2 4, 5
Armstrong Co.: Carll, J.F. 2
Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4

  - Elders Ridge quadrangle: Stone, R.W. 3
  - Foxburg quadrangle: Shaw, E.W. 2
  - Freeport quadrangle: Hughes, H.H. 1
  - Kittanning quadrangle: Butts, C. 3, 6
  - Rural Valley quadrangle: Butts, C. 5, 6
- Beaver Co.: Carll, J.F. 2; Mansfield, I.F. 3
  - Beaver quadrangle: Woolsey, L.H. 3, 4
  - Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
  - New Castle quadrangle: De Wolf, F.W. 1
  - Sewickley quadrangle: Munn, M.J. 4, 5
  - Zelienople quadrangle: Richardson, G.B. 12
- Butler Co.: Carll, J.F. 2; Clark, H.R. 1
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 2
  - Foxburg-Hilliards quadrangles: Shaw, E.W. 4
  - Hilliards quadrangle: Sherrill, R.E. 9
  - Kittanning quadrangle: Butts, C. 3, 6
  - New Kensington quadrangle: Richardson, G.B. 9
- northern: Chance, H.M. 4
  - Sewickley quadrangle: Munn, M.J. 4, 5
- Clarion Co.: Carll, J.F. 2; Chance, H.M. 6
  - Clarion quadrangle: Munn, M.J. 3; Shaw, E.W. 4
  - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Kittanning quadrangle: Butts, C. 3, 6
  - Oil City quadrangle: Dickey, P.A. 4, 5
  - Rural Valley quadrangle: Butts, C. 5, 6
- Clearfield Co., Punxsutawney quadrangle: Ashley, G.H. 33
- Crawford Co.: Carll, J.F. 2; Dickey, P.A. 2
  - Titusville quadrangle: Dickey, P.A. 6
- Fayette Co.: Gibbs, H.S. 1; Hickok, W.O. 10
- Forest Co.: Dickey, P.A. 2
  - Oil City quadrangle: Dickey, P.A. 4, 5
  - Tidioute quadrangle: Cathcart, S.H. 13
  - Titusville quadrangle: Dickey, P.A. 6
- Greene Co.: Stone, R.W. 1, 8, 33
  - Amity quadrangle: Clapp, F.G. 4, 6
  - Claysville quadrangle: Griswold, W.T. 2; Munn, M.J. 7
  - Rogersville quadrangle: Clapp, F.G. 5
- Indiana Co.
  - Elders Ridge quadrangle: Stone, R.W. 3
  - Punxsutawney quadrangle: Ashley, G.H. 33
- Jefferson Co., Punxsutawney quadrangle: Ashley, G.H. 33
- Lawrence Co.: Carll, J.F. 2; Clark, H.R. 1
  - New Castle quadrangle: De Wolf, F.W. 1
  - Zelienople quadrangle: Richardson, G.B. 12
- McKean Co.: Ashburner, C.A. 9, 14; Carll, J.F. 2; Fettke, C.R. 10, 24; Newby, J.B. 1
  - Bradford field: Fettke, C.R. 20
  - Music Mtn. field: Fettke, C.R. 25
- Mercer Co.: Carll, J.F. 2
- Northern: Cathcart, S.H. 11; Torrey, P.D. 3
  - Oriskany sandstone: Hamilton, S.H. 3
- Northwestern: Beers, F.W. 1; Fettke, C.R. 11, 13, 14; Lesley, J.P. 29, 51; Ridgway, T.S. 2; Rogers, H.D. 27, 28; Sayles, I. 1; Wrigley, H.E. 2
  - stratigraphic traps: Sherrill, R.E. 7
- origin, relation to coal and gas: Ashley, G.H. 19
- Potter Co.: Cathcart, S.H. 4, 5, 12
  - Gaines quadrangle: Fuller, M.L. 4
- Somerset Co.: Gibbs, H.S. 1
- Southeastern: Carter, O.C.S. 7
  - lack of possibilities: Ashley, G.H. 14
- Southwestern: James, J.R. 1; Jillson, W.R. 1; Munn, M.J. 1; Pepper, J.F. 1
  - deep drilling: White, I.C. 27
  - relation to structure: Clapp, F.G. 7
- Tioga Co.: Cathcart, S.H. 12; Fuller, M.L. 2
  - Gaines quadrangle: Fuller, M.L. 4
- Venango Co.: Carll, J.F. 1; Clark, H.R. 1; Dickey, P.A. 2; Evans, E.W. 1; Nettleton, E.S. 1
  - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Franklin quadrangle: Dickey, P.A. 5; Sherrill, R.E. 5
  - Hilliards quadrangle: Sherrill, R.E. 4, 9
  - Oil City quadrangle: Dickey, P.A. 4, 5
  - Titusville quadrangle: Dickey, P.A. 6

Warren Co.: Carll, J.F. 2, 4; Dickey, P.A. 2
  Tidioute area: Johnson, M.E. 2
  Tidioute pool: Johnson, M.E. 7
  Tidioute quadrangle: Cathcart, S.H. 13
  Titusville quadrangle: Dickey, P.A. 6
  Warren quadrangle: Butts, C. 11
Washington Co.: Ingham, A.I. 2; Stevenson, J.J. 3
  Amity quadrangle: Clapp, F.G. 4, 6
  Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
  Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
  Claysville quadrangle: Griswold, W.T. 2; Munn, M.J. 7
  McDonald oil field: Ingham, A.I. 3
  North Strabane area: Fettke, C.R. 29
  Pittsburgh quadrangle: Johnson, M.E. 9
  Rogersville quadrangle: Clapp, F.G. 5
  Steubenville quadrangle: Griswold, W.T. 2
Western: Andrews, E.B. 2; Arnold, R. 1; Ashburner, C.A. 7, 15, 38; Ashley, G.H. 29, 40, 76; Billingsley, J.E. 1; Boyd, C.R. 1; Brannt, W.T. 1; Burkart, H.J. 1; Burroughs, W.G. 1; Caddell, H.M. 1; Campbell, M.R. 5; Carll, J.F. 5, 7, 9; Claus, C.R. 1; Daddow, S.H. 1; Daly, M. 1, 2; Day, D.T. 2; Gesner, A. 1; Heck, E.T. 2; Hitchcock, C.H. 3; Hunt, T.S. 1; Johnson, R.H. 1; Leeds, A.R. 1; Lesley, J.P. 8, 9; Lilley, E.R. 1; Munn, M.J. 8; Myers, T.H. 1; Otsuka, S. 1; Peckham, S.F. 1; Plotts, W. 1, 3; Reger, D.B. 2; Remick, D.B. 1; Sisler, J.D. 28; Swartz, F.M. 19; Torrey, P.D. 5; Ver Wiebe, W.A. 5, 6, 9; Vicaire, A. 1; Wrigley, H.E. 1, 3
  analyses: Hickok, W.O. 3
  bibliography: Burroughs, E.H. 1; Cathcart, S.H. 14; Peckham, S.F. 2
  deep wells: White, I.C. 26
  generalized: Fuller, M.L. 10
  history: Goodrich, H.B. 1
  limiting factors: Ashley, G.H. 62
  mining: Dickey, P.A. 1; Torrey, P.D. 1
  1922 development: Johnson, M.E. 5
  oil sands, popular: Anon. 46
  Ordovician-Mississippian: Grabau, A.W. 13
  origin: Andrews, E.B. 1; Day, D.T. 1, 4
  popular: Anon. 50; Gale, T.A. 1; Newberry, J.S. 9
  possibilities: Sherrill, R.E. 8
  relation to gas: Carll, J.F. 5; Price, P.H. 5
  relation to structure: Clapp, F.G. 8
  reserves: Ashley, G.H. 27
  shale and coal sources: Fettke, C.R. 3
  Silurian-Devonian: Ashley, G.H. 22
Westmoreland Co.: Carll, J.F. 2
  Greensburg quadrangle: Johnson, M.E. 8
  New Kensington quadrangle: Richardson, G.B. 9
  Pittsburgh quadrangle: Johnson, M.E. 9

PETROLOGY, *see also* Igneous rocks, and individual rock types
  desert varnish, Lehigh Co.: Miller, B.L. 37
  Fayette Co., Waynesburg quadrangle: Stone, R.W. 4
  Greene Co.: Stevenson, J.J. 3
    Waynesburg quadrangle: Stone, R.W. 4
  Southwestern: Matteson, L.S. 1
  Washington Co., Waynesburg quadrangle: Stone, R.W. 4
  Western: Majorelle, J. 1

PHILADELPHIA COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Southeastern
  engineering geology, sand and gravel, properties: Blodgett, J.B. 1
Areal geology
  Chester-Germantown quadrangles: Bascom, F. 9
  Philadelphia area: Brown, R. 1; Lewis, H.C. 32; Troost, G. 1
  Philadelphia Co.: Hall, C.E. 7; Jewell, W. 1
  Philadelphia quadrangle: Bascom, F. 9
  Philadelphia Twp.: Rand, T.D. 16
  Trenton quadrangle: Bascom, F. 10
Economic geology
  barite, Trenton quadrangle: Bascom, F. 10
  coal, anthracite, river silt: Leidy, J. 10
  copper, Trenton quadrangle: Bascom, F. 10
  gold, Delaware River, placer: Corbin, J.R. 6
  graphite, Trenton quadrangle: Bascom, F. 10
  stone
    Chester - Germantown - Philadelphia quadrangles: Bascom, F. 9
    Trenton quadrangle: Bascom, F. 10

Ground water
- Philadelphia area: Bascom, F. 7; Carter, O.C.S. 5
  - artesian: Darton, N.H. 2
  - popular: Graham, J.B. 1
- Trenton quadrangle: Bascom, F. 10
- well logs: Carter, O.C.S. 2

Historical geology
- Pleistocene: Ehrenfield, F. 2
  - clay: Smith, A.H. 1
  - Philadelphia brick clay: Wright, G.F. 12
- Precambrian-Quaternary: Lewis, H.C. 32
  - Trenton quadrangle: Bascom, F. 10
- Precambrian-Tertiary
  - Chester-Germantown quadrangles: Bascom, F. 9
  - Philadelphia quadrangle: Bascom, F. 9
- Precambrian-Triassic: Hall, C.E. 7
- Quaternary: Browne, P.A. 1; Cresson, H.T. 1; Wright, G.F. 6
  - clay: Woolman, L. 2
  - Pensauken Formation: Strock, L.W. 1
- Tertiary: Chester, A.H. 1; Lewis, H.C. 16

Maps
- Geologic: Hall, C.E. 7; Jewell, W. 1; Lesley, J.P. 46, 47
  - Chester - Germantown - Philadelphia quadrangles: Bascom, F. 9
  - Philadelphia area: Troost, G. 1
  - Philadelphia Twp.: Rand, T.D. 16
  - Trenton quadrangle: Bascom, F. 10
  - Wissahickon schist: Weiss, J. 3
- Isograd, Glenarm series: McKinstry, H.E. 4
- Structure, Wissahickon schist: Weiss, J. 3

Mineralogy
- actinolite: Carpenter, G.W. 1
- allanite: Wherry, E.T. 2
- amethyst: Macfeeters, S. 1
- analcite: Foote, A.E. 1
- apatite: Carpenter, G.W. 1; Godon, S. 1
- aquacreptite: Parker, G.H. 1
- autunite: Lewis, H.C. 23; Wherry, E.T. 2
- beryl: Carpenter, G.W. 1
- bronzite: Leeds, A.R. 11
- calcite: Silliman, B. 1
- cassinite: Rand, T.D. 3
- chromite: Carpenter, G.W. 1
- columbite: Wherry, E.T. 2
- corundum: Seybert, A. 1
- cuprite: Lewis, H.C. 39
- disthene: Vanuxem, L. 2
- fahlunite: Lewis, H.C. 27
- Fairmount Park: Groth, E.A. 2
- garnet: Carpenter, G.W. 1; Robinson, W.C. 1
- halotrichite: Lewis, H.C. 24
- hyalite: Lewis, H.C. 19
- kyanite: Stone, R.W. 47
- lennilite: Rand, T.D. 3
- magnesite: Schaeffer, F.C. 1
- melanite: Wister, C.I. 1
- menaccanite: Ford, J. 1
- mica: Carpenter, G.W. 1
  - white: Postel, A.W. 6
- millerite: Rand, T.D. 7
- mineral collecting: Benge, E. 2; Carpenter, G.W. 3; Lea, I. 1; Rand, T.D. 21
- molybdenite: Brown, A.P. 2; Silliman, B. 1
  - epidote-bearing: Lewis, H.C. 7
- muscovite: Lewis, H.C. 31
  - lepidomelane inclusions: Lewis, H.C. 13
- oligoclase: Rand, T.D. 3
- orthoclase: Rand, T.D. 3
- philadelphite: Lewis, H.C. 11
- pistazite: Silliman, B. 1
- quartz: Carpenter, G.W. 1; Lewis, J.T. 1
- radioactive minerals: Wherry, E.T. 2
- randite: Koenig, G.A. 4; Wherry, E.T. 2
- rutile: Silliman, B. 1
- sappor: Silliman, B. 1
- scapolite: Wherry, E.T. 1
- schorl: Carpenter, G.W. 1
- serpentine, pseudomorph of dolomite: Lewis, H.C. 29
- soapstone: Rand, T.D. 3
- sphene, vanadium-bearing: Lewis, H.C. 18
- staurolite: Carpenter, G.W. 1
- steatite: Carpenter, G.W. 1; Rand, T.D. 3
- sunstone: Rand, T.D. 3
- talc, exfoliating: Lewis, H.C. 9
- titanite: Bruce, A. 1
- torbernite: Wherry, E.T. 2
- uranophane: Wherry, E.T. 2
- xenotime: Wherry, E.T. 2
- zeolites: Silliman, B. 1
- zircon: Carpenter, G.W. 1

Paleontology
- diatoms, Quaternary clay: Cunningham, K.M. 1
- humans, Pleistocene artifact: Lewis, H.C. 30
- tree, Quaternary: Richards, H.G. 1

Petrology
- diabase: Rand, T.D. 4
- gabbro alteration: Watson, E.H. 3

- gabbro boulders in schist: Leeds, A.R. 3
- Glenarm series, mineral isograds: McKinstry, H.E. 4
- gneiss: Browne, P.A. 2; Rand, T.D. 4
  - stratification: Rand, T.D. 10
- granite: Postel, A.W. 2; Rand, T.D. 4; Stelzner, A. 1
- mica schist: Rand, T.D. 25
- schist: Rand, T.D. 4
- sediments, properties: Blodgett, J.B. 1
- serpentine: Rand, T.D. 4
- soapstone: Rand, T.D. 4
- Wissahickon schist: Ch'Ih, Chi Sang 1; Postel, A.W. 5; Weiss, J. 3

Physical geology
- faulting, Recent: Rand, T.D. 1

Physiography
- glacial boulders: Lesley, J.P. 25
- glacial features: Hall, C.E. 2
- gravel: Klingsburg, C. 1
  - Quaternary: Wright, G.F. 6

PHILADELPHITE, *see* Vermiculite

PHOSPHATE, *see also* phosphate-bearing minerals
- Cumberland Co.: Stone, R.W. 47
- Juniata Co.: Ihlseng, M.C. 1; Stone, R.W. 47
- Pennsylvania: Ashley, G.H. 76

PHOSPHOROUS, *see also* phosphorous-bearing minerals
- Cumberland Co.: Stose, G.W. 7
- Pennsylvania, in coal: Britton, J.B. 1

PHYSIOGRAPHY, *see also* individual features
- Eastern: Johnson, D.W. 5
- erosion surfaces
  - Lehigh Co.: Miller, B.L. 45
  - Pennsylvania: Blood, P. 1
- gorges: Pike-Wyoming Cos.: Davis, W.M. 2
- landslides, Crawford Co.: Smallwood, W.M. 1
- Pennsylvania: Ashley, G.H. 52, 56; Bryan, K. 1; Fenneman, N.M. 1, 2; Loomis, F.B. 1; Powell, J.W. 1; Tower, W.S. 1
  - age: Ashley, G.H. 45
  - Appalachian Mtns.: Willis, B. 4
  - popular: Bechdolt, A.F. 1
  - provinces: Atwood, W.W. 1
  - soil erosion: Patrick, A.L. 1
- Presque Isle, Erie Co.: Ingersoll, T.D. 1; Wilson, A.W.G. 1
- subordinate-height ridges, Pennsylvania: Eaton, H.N. 4
- Susquehanna basin, Northern: Hollister, G.B. 1
- Western, popular: Arthur, E.W. 1

PHYTOCOLITE
- Lackawanna Co.: Cooper, T. 1; Lewis, H.C. 26

PIEDMONTITE
- Adams Co.: Stose, G.W. 21
- Franklin Co.: Williams, G.H. 3

PIKE COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern

Areal geology
- Pike Co.: White, I.C. 11
- Pocono plateau: Wagner, N.S. 1

Economic geology
- flagstone: Stone, R.W. 19
- gold, Juniata conglomerate, Ordovician: Corbin, J.R. 6

Ground water
- Pike Co.: Lohman, S.W. 1

Historical geology
- Devonian: Prosser, C.S. 3
- Devonian-Mississippian: Wagner, N.S. 1
- Silurian-Pennsylvanian: White, I.C. 11

Maps
- Geologic: Lesley, J.P. 46, 47; Wagner, N.S. 1; White, I.C. 11
- Physiographic, glacial features: White, I.C. 11

Paleontology
- Devonian, Hamilton group: Heilprin, A. 2
- coral reef: Willard, B. 30

Physiography
- Delaware Valley: Happ, S.C. 1
- deltas, Delaware River: Happ, S.C. 2
- glacial geology: White, I.C. 11
- gorges: Davis, W.M. 2
- peneplains: Happ, S.C. 1

PIMELITE
- Delaware Co.: Goldsmith, E. 1

PISCES, *see also* Vertebrata
- Beaver Co., Pennsylvanian: Westoll, T.S. 1
  - Blair Co., Pennsylvanian: Leidy, J. 2
- Bradford Co.
  - Devonian
    - Catskill Formation: Chadwick, G.H. 1
    - Chemung Formation: Claypole, E.W. 2; Cope, E.D. 8
- Chester Co., Triassic: Lea, I. 10; Leidy, J. 4, 5; Lewis, H.C. 35
- Columbia Co., Devonian: Leidy, J. 2
- Crawford Co., Mississippian: Eastman, C.R. 1

Dauphin Co., Pennsylvanian: Leidy, J. 8
Lackawanna Co., Devonian: Cope, E.D. 12
Luzerne Co.
  Devonian: Cope, E.D. 12
  Pennsylvanian: Lea, I. 8
Montgomery Co., Triassic: Bryant, W.L. 2; Lea, I. 12; Leidy, J. 11
Northwestern, Devonian-Mississippian: Caster, K.E. 1
Pennsylvania, Paleozoic: Newberry, J.S. 8
Perry Co., Silurian: Bryant, W.L. 1; Claypole, E.W. 9, 13, 18, 26
Susquehanna Co., Devonian, Chemung Formation: Claypole, E.W. 1
Tioga Co.
  Devonian: Cope, E.D. 12; Gregory, W.K. 2; Hall, J. 1; Leidy, J. 2, 3
    Catskill Formation: Conrad, T.A. 2; Cope, E.D. 8
    Chemung Formation: Claypole, E.W. 17
Western, Pennsylvanian: Leidy, J. 1
Wyoming Co., Devonian: Newberry, J.S. 4
York Co., Triassic: Wanner, H.E. 1

PISTACITE, *see* Epidote

PLATINUM
Lancaster Co.: Genth, F.A. 4

PLEISTOCENE, *see also* Cenozoic, Glacial geology, and Quaternary
Allegheny Co.: Adamson, J.H. 3; Schopf, J.M. 1
  Brownsville quadrangle: Campbell, M.R. 2
  Burgettstown quadrangle: Shaw, E.W. 3
  Sewickley quadrangle: Munn, M.J. 5
Armstrong Co., Rural Valley quadrangle: Butts, C. 5
Beaver Co.
  Burgettstown quadrangle: Shaw, E.W. 3
  New Castle quadrangle: De Wolf, F.W. 1
  Sewickley quadrangle: Munn, M.J. 5
  Zelienople quadrangle: Richardson, G.B. 12
Bucks Co., Allentown quadrangle: Miller, B.L. 14
Butler Co., Butler-Zelienople quadrangles: Richardson, G.B. 12
  Sewickley quadrangle: Munn, M.J. 5
Clarion Co., Rural Valley quadrangle: Butts, C. 5
Clinton Co.: Ulmer, L.J. 1
Crawford Co.: White, I.C. 9
Eastern, Pensauken gravel: Campbell, M.R. 17
Erie Co.: White, I.C. 9
Fayette Co.: Moyer, F.T. 2
  Brownsville-Connellsville quadrangles: Campbell, M.R. 2
  Masontown-Uniontown quadrangles: Campbell, M.R. 1
  Waynesburg quadrangle: Stone, R.W. 4
Greene Co.: Stone, R.W. 33
  Claysville quadrangle: Munn, M.J. 7
  Masontown quadrangle: Campbell, M.R. 1
  Waynesburg quadrangle: Stone, R.W. 4
Indiana Co., Latrobe quadrangle: Campbell, M.R. 6
Lancaster Co., Lancaster quadrangle: Jonas, A.I. 10
Lawrence Co.
  New Castle quadrangle: De Wolf, F.W. 1
  Zelienople quadrangle: Richardson, G.B. 12
Lehigh Co.: Lesley, J.P. 42; Wililams, E.H. 4
  Allentown quadrangle: Miller, B.L. 14
Mercer Co.: White, I.C. 7
Montgomery Co., Port Kennedy cave: Heilprin, A. 3
Northampton Co.: Lesley, J.P. 42
  Allentown quadrangle: Miller, B.L. 14
Northwestern: Carll, J.F. 3
Philadelphia Co.: Wright, G.F. 12
  clay: Smith, A.H. 1
Potter Co., Gaines quadrangle: Fuller, M.L. 4
Schuylkill Co.: Williamson, E.H. 8
Tioga Co., Gaines quadrangle: Fuller, M.L. 4
Warren Co., Warren quadrangle: Butts, C. 11
Washington Co.
  Brownsville-Connellsville quadrangles: Campbell, M.R. 2
  Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
  Carnegie quadrangle: Munn, M.J. 7
  Masontown quadrangle: Campbell, M.R. 1
  Waynesburg quadrangle: Stone, R.W. 4
Westmoreland Co., Latrobe quadrangle: Campbell, M.R. 6

PLIOCENE
Lancaster Co., Lancaster quadrangle: Jonas, A.I. 10

POLYLITH
Centre Co., weathering rates: Bonine, C.A. 1

POPULAR AND ELEMENTARY
Allegheny Co., Pittsburgh area: Leighton, H. 3
Appalachian Highlands, origin: Billings, M.P. 1
Appalachian Mountains: Ashley, G.H. 74
Bake Oven Knob, Lehigh Co.: Berlin, A.F. 1
Boiling Springs, Cumberland Co.: Stone, R.W. 45
brownstone, Dauphin Co.: Bolton, F.J. 1
carnotite, Carbon Co.: Myers, R.E. 1
caves
  Central: Zeller, R.A. 2
  Monroe Co.: Darton, N.H. 1
  Pennsylvania: Stone, R.W. 52
coal, anthracite: Bowen, E. 1
  Wyoming Co.: Maxwell, V.L. 1
coal, origin and resources: Sheafer, P.W. 7
  Pennsylvania: Andrews, E.B. 3; Nicolls, W.J. 1
Delaware Co.: Lightfoot, T.M. 1
dinosaur
  Adams Co.: Anon. 41
  York Co.: Ashley, G.H. 82
Eagle's Mere Lake, Sullivan Co.: Ashley, G.H. 75
earthquakes: Anon. 60; Stone, R.W. 57
forests, relation to physiography: Howell, T.R. 1
geologic history
  Monroe Co.: Myers, R.E. 5
  Pennsylvania: Ashley, G.H. 44, 65; Stone, R.W. 55; Willard, B. 28
glacial geology
  Butler Co.: Preston, F.W. 2
  Pennsylvania: Anon. 51
gold, Pennsylvania: Stone, R.W. 46
Grand Canyon of the Susquehanna, Tioga Co.: Ashley, G.H. 83
ground water
  Allegheny Co.: Adamson, J.H. 2, 4
  Montgomery Co.: Foose, R.M. 4
  Pennsylvania: Adamson, J.H. 1; Ashley, G.H. 78; Graham, J.B. 2; Stone, R.W. 47
  Philadelphia Co.: Graham, J.B. 1
iron
  Pennsylvania: Newberry, J.S. 3
  Southeastern: Foose, R.M. 15
jasper, Berks-Lehigh Cos.: Myers, R.E. 2
Lake Pymatuning, Crawford Co.: Anon. 48
man, Pleistocene: Anon. 37
metal resources, Pennsylvania: Stone, R.W. 51
meteorites
  Adams Co.: Stone, R.W. 49
  Allegheny Co.: Stone, R.W. 58
  Butler Co.: Anon. 57
  Centre Co.: Anon. 59
  Pennsylvania: Anon. 31
mineral resources
  Lancaster Co.: Foose, R.M. 6
  Pennsylvania: Anon. 45; Ashley, G.H. 25, 35, 39, 44
oil sands, Pennsylvania: Anon. 46
paleontology, Pennsylvania: Willard, B. 32
Paleozoic paleogeography, Pennsylvania: Leeds, A.R. 5
peneplains, Pennsylvania: Anon. 40, 55
Pennsylvania Geological Survey: Ashley, G.H. 73; Logue, T.A. 1; Stone, R.W. 42
petroleum: Anon. 43, 50; Newberry, J.S. 9
  Western: Gale, T.A. 1
physiography: Anon. 32, 39; Ashley, G.H. 64, 66; Bechdolt, A.F. 1
  Western: Arthur, E.W. 1
potholes, Lancaster Co., Susquehanna River: Beck, H.H. 2
Precambrian rocks, Pennsylvania: Leeds, A.R. 6
ringing rocks, Bucks Co.: Anon. 42
rock age-determination: Anon. 34
salt, Pennsylvania: Anon. 54
slate, Eastern: Merrill, G.P. 3
stone, Pennsylvania: Anon. 36; Merrill, G.P. 2
structure, Pocono plateau: Ashley, G.H. 72
"ticklish" (balanced) rock, Sullivan Co.: Anon. 56
Triassic history, Montgomery Co.: Myers, R.E. 4
triple divide, Potter Co.: Anon. 35
turnpike geology, Pennsylvania: Cleaves, A.B. 6
unsolved problems: Anon. 49
vertebrate fossils: Anon. 53
war minerals: Foose, R.M. 10
warm springs, Huntingdon-Perry Cos.: Stone, R.W. 54
water and wind gaps: Johnson, D.W. 7; Willard, B. 58
zinc, Lehigh Co.: Blank, E.W. 1

PORIFERA
Erie Co., Devonian, Chemung Formation: Clarke, J.M. 6
Lancaster Co., Cambrian: Resser, C.E. 3

- Northwestern, Devonian-Mississippian: Caster, K.E. 1
- Perry Co., Devonian: Howell, B.F. 8
- Tioga Co., Devonian: Hall, J. 9
- Warren Co., Devonian: Hall, J. 9
- Western, Devonian-Mississippian: Caster, K.E. 11

POROSITY
- Bradford sand
  - Northern: Fettke, C.R. 18
  - Tioga Co.: Rosenfeld, M.A. 1
- oil-bearing sandstones, Pennsylvania: Honess, A.P. 3; Krynine, P.D. 11
- Oriskany sandstone, Devonian
  - McKean Co.: Fettke, C.R. 10
  - Pennsylvania: Krynine, P.D. 6
  - Tioga Co.: Fettke, C.R. 7
- sandstones, Pennsylvania, relation to permeability: Barb, C.F. 1
- Venango sand, Venango Co.: Rosenfeld, M.A. 1

POTASH, *see also* potassium-bearing minerals
- Southeastern: Stone, R.W. 47
- Tioga Co.: Stone, R.W. 18

POTHOLES
- Lackawanna Co.: Ashburner, C.A. 31; Branner, J.C. 2; Dana, J.D. 3; Davis, R.N. 2; Eaton, H.N. 2
- Lancaster Co., Susquehanna River: Beck, H.H. 2, 3
- Lehigh Co., Bake Oven Knob: Berlin, A.F. 1
- Luzerne Co., buried: Ashburner, C.A. 40
- Western, Beaver River: Hice, R.R. 2
- Wyoming Co., Susquehanna River: Corss, F. 1

POTTER COUNTY, *see also* Pennsylvania, Pennsylvania-Northern, Pennsylvania-Northwestern, and Pennsylvania-Western

Areal geology
- Gaines quadrangle: Fuller, M.L. 4
- Potter Co.: Sherwood, A. 3

Economic geology
- coal, bituminous: Platt, F. 5; Sisler, J.D. 14, 27
  - Coudersport coal basin: Platt, F. 8
  - Gaines quadrangle: Fuller, M.L. 4
  - Oleona coal basin: Platt, F. 11
  - Pine Creek coal basin: Platt, F. 12
- gravel, Gaines quadrangle: Fuller, M.L. 4
- iron: Platt, F. 5
  - Gaines quadrangle: Fuller, M.L. 4
- limestone, Gaines quadrangle: Fuller, M.L. 4
- natural gas: Cathcart, S.H. 5; Reeves, J.R. 1
  - East Fork-Wharton field: Ebright, J.R. 1
  - Gaines quadrangle: Fuller, M.L. 4
- petroleum: Carll, J.F. 4, 9; Cathcart, S.H. 4, 5, 12
  - Gaines quadrangle: Fuller, M.L. 4
- stone, Gaines quadrangle: Fuller, M.L. 4

Historical geology
- Cambrian- Pennsylvanian: Torrey, P.D. 3
- Devonian: Bennett, J. 1; Reeves, J.R. 1
- Devonian-Mississippian: Ashburner, C.A. 11; Platt, F. 10
  - Abbott-West Branch Twps.: Ashburner, C.A. 30
- Devonian-Pennsylvanian: Cathcart, S.H. 5; Sherwood, A. 3
  - East Fork-Wharton area: Ebright, J.R. 1
- Devonian-Pleistocene, Gaines quadrangle: Fuller, M.L. 4
- Pennsylvanian: Platt, F. 8
- Pleistocene, glacial lake features: Willard, B. 10
- Silurian-Pennsylvanian: Ashley, G.H. 49

Maps
- Economic, natural gas, East Fork-Wharton field: Ebright, J.R. 1
- Geologic: Lesley, J.P. 46, 47; Sherwood, A. 3
  - Gaines quadrangle: Fuller, M.L. 4
- Structure: Cathcart, S.H. 5
  - Gaines quadrangle: Fuller, M.L. 4
- Structure contour
  - Oriskany sandstone, Devonian: Finn, F.H. 1
  - Wolf Creek conglomerate, Devonian: Finn, F.H. 1

Paleontology
- eurypterid, Devonian: Willard, B. 12

Physical geology
- Hebron anticline: Platt, F. 10
- Oswago syncline: Platt, F. 10
- structure: Sherwood, A. 3

Physiography
- kames: Lewis, H.C. 40
- glacial features, Gaines quadrangle: Fuller, M.L. 4
- glacial lake features: Willard, B. 10
- triple divide, popular: Anon. 35

PRECAMBRIAN
- Adams Co.: Frazer, P. 13; Hickok, W.O. 8; Keith, A. 1; Stose, G.W. 21

  - Fairfield-Gettysburg quadrangles: Stose, G.W. 27
  - Hanover quadrangle: Stose, A.I.J. 1
- Berks Co.: D'Invilliers, E.V. 1; Leidy, J. 14; Lesley, J.P. 42; Miller, B.L. 31
  - South Mtn. area: Eaton, H.N. 1
- bibliography: Steidtmann, E. 1
- Bucks Co.: Hall, C.E. 7
  - Allentown quadrangle: Miller, B.L. 14
  - Delaware Water Gap-Easton quadrangles: Bayley, W.S. 2
  - Doylestown-Quakertown quadrangles: Bascom, F. 17
  - Germantown quadrangle: Bascom, F. 9
  - Trenton quadrangle: Bascom, F. 10
- Chester Co.: Frazer, P. 30; Hartman, W.D. 1; Hawkins, A.C. 2; Jonas, A.I. 2; Lesley, J.P. 41; Willig, E.S. 1
  - Coatesville-West Chester quadrangles: Bascom, F. 18
  - Doe Run-Avondale area: Bliss, E.F. 2
  - Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  - Norristown quadrangle: Bascom, F. 9
  - Quarryville quadrangle: Jonas, A.I. 6; Knopf, E.F.B. 4
  - schist: Rand, T.D. 19
  - Wissahickon schist: Dike, P.A. 1
- Cumberland Co.: Hickok, W.O. 8
  - Fairfield quadrangle: Stose, G.W. 27
- Delaware Co.: Hall, C.E. 9
  - Norristown quadrangle: Bascom, F. 9
  - Radnor area: Rand, T.D. 16
  - West Chester quadrangle: Bascom, F. 18
- Franklin Co.: Keith, A. 1
  - Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
  - Fairfield quadrangle: Stose, G.W. 27
- Lancaster Co.: Cloos, E. 8; Frazer, P. 29, 35; Jonas, A.I. 15; Platt, F. 16
  - Coatesville quadrangle: Bascom, F. 18
  - Honeybrook quadrangle: Bascom, F. 21
  - McCalls Ferry quadrangle: Jonas, A.I. 5; Knopf, E.F.B. 4
  - Middletown quadrangle: Stose, G.W. 33
  - New Holland quadrangle: Jonas, A.I. 7
  - Quarryville quadrangle: Jonas, A.I. 6; Knopf, E.F.B. 4
  - South Mtn. area: Eaton, H.N. 1
  - southern: Cloos, E. 3.
- Lebanon Co., South Mtn. area: Eaton, H.N. 1
- Lehigh Co.: Lesley, J.P. 42; Miller, B.L. 47; Prime, F. 4
  - Allentown quadrangle: Miller, B.L. 14
  - Byram granite gneiss: Fraser, D.M. 16
  - Franklin Formation: Fraser, D.M. 16
  - Lower Milford Twp.: Brown, C.W. 1
  - metadiabase: Fraser, D.M. 16
  - Moravian Heights Formation: Fraser, D.M. 16
  - pegmatite: Fraser, D.M. 16
  - Pochuck gneiss: Fraser, D.M. 16
  - Quakertown quadrangle: Bascom, F. 17
- Montgomery Co.: Frazer, P. 36; Hall, C.E. 7; Rand, T.D. 17
  - Germantown-Norristown quadrangles: Bascom, F. 9
  - Quakertown quadrangle: Bascom, F. 17
- Northampton Co.: Fraser, D.M. 11, 12; Lesley, J.P. 42; Miller, B.L. 29, 39; Peck, F.B. 8
  - Allentown quadrangle: Miller, B.L. 14
  - Delaware Water Gap-Easton quadrangles: Bayley, W.S. 2
  - Northeastern, glaciation: Rogers, H.D. 7
- Philadelphia Co.: Hall, C.E. 7; Lewis, H.C. 32
  - Germantown-Philadelphia quadrangles: Bascom, F. 9
  - Trenton quadrangle: Bascom, F. 10
  - Wissahickon schist: Ch'Ih Chi Sang 1; Weiss, J. 3
- Southeastern: Ashley, G.H. 44; Bascom, F. 8; Claypole, E.W. 24; Frazer, P. 31, 32; Hall, C.E. 6; Hawkins, A.C. 2; Hitchcock, C.H. 8; Hopkins, T.C. 3; Hunt, T.S. 2, 7, 8, 10; Jonas, A.I. 4, 8; Lesley, J.P. 67; Mackin, J.H. 3; Martin, D.S. 1; Mathews, E.B. 1; Miller, B.L. 22, 23; Miller, W.J. 1; Nelson, W.A. 1; Platt, F. 16; Rand, T.D. 27; Rogers, H.D. 4, 5, 25, 26; Schuchert, C. 23; Steidtmann, E. 1; Swartz, F.M. 21; Van Hise, C.R. 1, 2; Watson, E.H. 1, 2; Whitney, J.D. 1; Willis, B. 8; Winchell, A. 1
  - Glenarm series, metamorphism and stratigraphy: Knopf, E.F.B. 2
  - historical review: Hunt, T.S. 9
  - limestone: Mitman, C.W. 1
  - metamorphosed sediments: Wherry, E.T. 22
  - Piedmont district: Bascom, F. 8

  popular: Ashley, G.H. 65; Leeds, A.R. 6
  Reading Prong: Barrell, J. 2
  volcanics: Williams, G.H. 5
 York Co.: Demming, H.C. 1; Frazer, P. 13, 37; Hickok, W.O. 8; Mathews, E.B. 1; Stose, G.W. 39
  Hanover-York quadrangles: Stose, A.I.J. 1
  McCalls Ferry quadrangle: Jonas, A.I. 5; Knopf, E.F.B. 4
  Middletown quadrangle: Stose, G.W. 33

PREHNITE
 Berks Co.: Fraser, D.M. 9; Thomas, C.A. 5
 Chester Co.: Thomas, C.A. 9
 Lebanon Co.: Genth, F.A. 17

PROCHLORITE
 Northampton Co.: Eyerman, J. 6

PYRITE, *see also* Iron, and Sulphur
 Armstrong Co.: Hamilton, H.V. 1
 Bucks Co.: Morton, S.G. 1
 Chester Co.: Eyerman, J. 1, 2; Vaux, G. 2; Wherry, E.T. 26
  cobalt-bearing: Genth, F.A. 26
 Delaware Co.: Penfield, S.L. 2
 Lancaster Co., magnetic: Boyé, M.H. 1
  limonite pseudomorphs: Willig, H.L. 1
 Lebanon Co.: Hawkins, A.C. 3; Travis, C. 1; Ulke, T. 1
 Lehigh Co.: Miller, B.L. 44
  Allentown quadrangle: Miller, B.L. 14
 Luzerne Co.: Northup, M.A. 2, 3
 Montgomery Co.: Gehman, G.W. 1; Haeberle, W.F. 1
 Northampton Co.: Allentown quadrangle: Miller, B.L. 14
 Pennsylvania, in coal: Ashley, G. H. 15; Brown, A.P. 1
 Western: Ashley, G.H. 40; Leighton, H. 1, 2
 York Co., limonite pseudomorphs: Holden, E.F. 1

PYROLUSITE
 Lehigh Co.: Smith, E.F. 2

PYROMORPHITE
 Chester Co.: Lewis, T.J. 2; Smith, J.L. 1; Thomas, C.A. 8
 Montgomery Co.: Boucot, A.J. 1; Gordon, S. 1

PYROPHYLLITE
 Adams Co.: Stephenson, R.C. 1
 Luzerne Co.: Genth, F.A. 15; Northup, M.A. 3
 Schuylkill Co.: Genth, F.A. 13; Taylor, W.J. 3

PYROXENE
 augite, York Co.: Ehrenfield, C.H. 3
 Berks Co.: Smith, E.F. 4
 bronzite
  Lancaster Co.: Genth, F.A. 5
  Philadelphia Co.: Leeds, A.R. 11
 Bucks Co.: Morton, S.G. 1
 hypersthene: Claven, W. 1

QUARTZ, *see also* Sand, Sand and gravel, and Roofing granules
 Adams Co.: Stose, G.W. 21
  Fairfield-Gettysburg quadrangles: Stose, G.W. 27
 amethyst
  Chester Co.: Jefferies, M.N. 2
  Philadelphia Co.: Macfeeter, S. 1
 Armstrong Co.: Hamilton, H.V. 1
 Bucks Co.: Morton, S.G. 1; Vanartsdalen, J.F. 3
  inclusions: Bilgram, H. 1
 Carbon Co.: Zodac, P. 1
 Chester Co.: Groth, E.A. 1; Thomas, C.A. 3, 8
  pseudomorphs: Vaux, G. 1
  serpentine-derived: Rand, T.D. 8
 Cumberland Co., Fairfield quadrangle: Stose, G.W. 27
 Franklin Co., Fairfield quadrangle: Stose, G.W. 27
 Lancaster Co.: Taber, T. 1
 Luzerne Co.: Northup, M.A. 2
  limpid: Porter, J. 1
 Lycoming Co.: Meyer, A. 4
 Montgomery Co.: Benge, E. 1; Carter, O.C.S. 1; Schaeffer, F.C. 1
 Northampton Co.: Eyerman, J. 1
 Philadelphia Co.: Carpenter, G.W. 1; Lewis, T.J. 1
 Southeastern: Stone, R.W. 47
 Tioga Co.: Meyer, A. 4
 York Co., origin: Frazer, P. 12

QUARTZITE, *see also* Metamorphic rocks
 Southern, Paleozoic, petrofabrics: Fellows, R.E. 1

QUATERNARY, *see also* Cenozoic, and Pleistocene
 Adams Co.: Stose, G.W. 21
 Bucks Co., Trenton quadrangle: Bascom, F. 10
 Chester Co.: Lesley, J.P. 41
 Delaware Co., Chester-Norristown quadrangles: Bascom, F. 9
 Eastern, Trenton gravel: Lewis, H.C. 2
 Franklin Co., Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
 Fulton Co., Mercersburg quadrangle: Stose, G.W. 10
 Indiana Co., Elders Ridge quadrangle: Stone, R.W. 5

Lawrence Co.: White, I.C. 5
Montgomery Co., Germantown quadrangle: Bascom, F. 9
Pennsylvania: Braun, E.L. 1; Hopkins, T.C. 3; Hunt, T.S. 4
biogeography: Deevey, E.S. 1
Philadelphia Co.: Browne, P.A. 1; Cresson, H.T. 1; Ehrenfield, F. 2; Lewis, H.C. 16, 32; Woolman, L. 2; Wright, G.F. 6
Germantown-Philadelphia quadrangles: Bascom, F. 9
Pensauken Formation: Strock, L.W. 1
Trenton quadrangle: Bascom, F. 10
Southeastern: McGee, WJ 2
Western: Gibson, J.B. 2

RADIOACTIVE MINERALS, *see also* individual types, and Mineralogy
Southeastern: Stone, R.W. 47; Wherry, E.T. 2

RANDITE
Philadelphia Co.: Koenig, G.A. 4; Wherry, E.T. 2

REEFS
Northeastern, Devonian: Willard, B. 30

REIBECKITE, *see* Amphibole

REPTILIA, *see also* Vertebrata
Adams Co., Triassic, popular: Anon. 41
Allegheny Co., Pennsylvanian: Case, E.C. 1; Moore, W.D. 1; Raymond, P.E. 2
Blair Co., Quaternary: Holland, W.J. 1; Peterson, O.A. 1
Bucks Co., Triassic: Sinclair, W.J. 1
Chester Co., Triassic: Cope, E.D. 1, 3, 6; Heune, F. von 1; Lea, I. 10, 11; Leidy, J. 5; Lesley, J.P. 41; Lewis, H.C. 35
Cumberland Co., Triassic: Willard, B. 19
Lehigh Co., Triassic: Lea, I. 6, 7
Luzerne Co., Pennsylvanian: Lacoe, R.D. 1; Packard, A.S. 1
Montgomery Co.
Pleistocene: Cope, E.D. 13; Wheatley, C.M. 2
Triassic: Bock, W. 1; Colbert, E.H. 2; Lyman, B.S. 12
Northeastern, Mississippian: Rogers, H.D. 19
phytosaur, Lehigh Co., Triassic: Colbert, E.H. 1
pterodactyl, Southeastern, Triassic: Cope, E.D. 2
Schuylkill Co.
Devonian: Lea, I. 4
Mississippian: Lea, I. 3
Pennsylvanian: Mason, W.D. 1
snake, Susquehanna Co., Pennsylvanian: Eaton, A. 3
Southeastern, Triassic: Cope, E.D. 7
Southwestern, Permian: Burke, J.J. 2
Westmoreland Co., Pennsylvanian: King, A.T. 1; Lyell, C. 3, 4
York Co., Triassic: Hickok, W.O. 4; Sinclair, W.J. 2; Wanner, A. 1, Wanner, H.E. 1, 2; Willard, B. 51
popular: Ashley, G.H. 82
tracks: Hitchcock, C.H. 10

RHODOCHROME, *see* Penninite

RHODOPHYLLITE, *see* Penninite

RHYOLITE, *see also* Igneous rocks
Adams Co. Williams, G.H. 2
Blue Ridge area: Bascom, F. 4
Franklin Co., Blue Ridge area: Bascom, F. 4

RIPIDOLITE, *see* Clinochlore

ROOFING GRANULES
Adams Co.: Stose, G.W. 21
Fairfield-Gettysburg quadrangles: Stose, G.W. 27
Cumberland Co., Fairfield quadrangle: Stose, G.W. 27
Franklin Co., Fairfield quadrangle: Stose, G.W. 27
Southeastern: Stone, R.W. 20

RUTILE
Bucks Co.: Genth, F.A. 16
Chester Co.: Stone, R.W. 47
Delaware Co. Bruce, A. 1
Pennsylvania: Stone, R.W. 39
Philadelphia Co.: Silliman, B. 1

SALT, *see also* salt-bearing minerals, and connate water
Armstrong Co.: Platt, W.G. 2
Bradford Co.: Wells, H. 1
Indiana Co., Latrobe quadrangle: Campbell, M.R. 6
Northern: Stone, R.W. 47
Pennsylvania: Ashley, G.H. 76; B. and O. RR. Co., Indus. Dev. Staff 1; Pierce, J. 1
popular: Anon. 54
Western: Ashley, G.H. 40; Stone, R.W. 44, 47
Westmoreland Co., Latrobe quadrangle: Campbell, M.R. 6

SAND, *see also* Glass sand, and Sand and gravel
Allegheny Co.: Shaw, E.W. 1
Beaver quadrangle: Woolsey, L.H. 4

  Brownsville quadrangle: Campbell, M.R. 2
  Sewickley quadrangle: Munn, M.J. 5
Armstrong Co.: Shaw, E.W. 1
  Kittanning quadrangle: Butts, C. 3
Beaver Co.: Shaw, E.W. 1
  Beaver quadrangle: Woolsey, L.H. 4
  Sewickley quadrangle: Munn, M.J. 5
Bedford-Huntingdon Cos., Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
Blair Co., Hollidaysburg quadrangle: Butts, C. 20
Bucks Co.
  Doylestown quadrangle: Bascom, F. 17
  Honeybrook quadrangle: Bascom, F. 21
Butler Co.
  Kittanning quadrangle: Butts, C. 3
  Sewickley quadrangle: Munn, M.J. 5
Cambria-Indiana Cos., Johnstown quadrangle: Phalen, W.C. 4
Chester Co., Honeybrook-Phoenixville quadrangles: Bascom, F. 21
Clarion Co., Kittanning quadrangle: Butts, C. 3
Fayette Co., Brownsville-Connellsville quadrangles: Campbell, M.R. 2
Franklin Co., Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
Indiana Co., Latrobe quadrangle: Campbell, M.R. 6
Lackawanna Co.: Darton, N.H. 4
Lancaster Co.: Jonas, A.I. 6; Landis, D.B. 1
  Honeybrook quadrangle: Bascom, F. 21
  Middletown quadrangle: Stose, G.W. 33
  New Holland quadrangle: Jonas, A.I. 7
Luzerne Co.: Darton, N.H. 7
Pennsylvania: Ashley, G.H. 76; Fettke, C.R. 1, 2; Stone, R.W. 22, 26
Perry Co.: Claypole, E.W. 16
Somerset Co., Johnstown quadrangle: Phalen, W.C. 4
Washington Co., Brownsville quadrangle: Campbell, M.R. 2
Westmoreland Co.
  Connellsville quadrangle: Campbell, M.R. 2
  Johnstown quadrangle: Phalen, W.C. 4
  Latrobe quadrangle: Campbell, M.R. 6
York Co.: Stose, G.W. 39
  Hanover-York area: Stose, A.I.J. 1
  Middletown quadrangle: Stose, G.W. 33

SAND AND GRAVEL, *see also* Sand, and Gravel individually
  Adams Co.: Stose, G.W. 21
    Fairfield-Gettysburg quadrangles: Stose, G.W. 27
  Allegheny Co.
    Freeport quadrangle: Hughes, H.H. 1
    Pittsburgh quadrangle: Johnson, M.E. 9
  Armstrong Co., Freeport quadrangle: Hughes, H.H. 1
  Beaver Co.
    New Castle quadrangle: De Wolf, F.W. 1
    Zelienople quadrangle: Richardson, G.B. 12
  Bucks Co., Allentown quadrangle: Miller, B.L. 14
  Butler Co., Butler-Zelienople quadrangles: Richardson, G.B. 12
  Central: Ward, F. 1
  Cumberland Co., Fairfield quadrangle: Stose, G.W. 27
  Dauphin Co., Susquehanna River: Bashore, H.B. 1
  Fayette Co.: Hickok, W.O. 10
  Franklin Co., Fairfield quadrangle: Stose, G.W. 27
  Lawrence Co.
    New Castle quadrangle: De Wolf, F.W. 1
    Zelienople quadrangle: Richardson, G.B. 12
  Lehigh Co.: Miller, B.L. 44
    Allentown quadrangle: Miller, B.L. 14
  Northampton Co.: Miller, B.L. 28
  Northeastern: Ward, F. 2
  Southeastern: Ward, F. 4
  Tioga Co., Elkland-Tioga quadrangles: Fuller, M.L. 3
  Warren Co., Warren quadrangle: Butts, C. 11
  Washington Co., Pittsburgh quadrangle: Johnson, M.E. 9
  Western: Ashley, G.H. 40
  Westmoreland Co.
    Freeport quadrangle: Hughes, H.H. 1
    Pittsburgh quadrangle: Johnson, M.E. 9

SANDSTONE
  Allegheny Co.
    Beaver quadrangle: Woolsey, L.H. 3, 4
    Freeport quadrangle: Hughes, H.H. 1
    Pittsburgh quadrangle: Johnson, M.E. 9

- Armstrong Co.: Platt, W.G. 2
  - Clarion quadrangle: Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 3
  - Freeport quadrangle: Hughes, H.H. 1
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Beaver Co.: Mansfield, I.F. 3
  - Beaver quadrangle: Woolsey, L.H. 3, 4
  - New Castle quadrangle: De Wolf, F.W. 1
  - Zelienople quadrangle: Richardson, G.B. 12
- Blair Co., Patton quadrangle: Campbell, M.R. 8
- Bradford Co.: Wells, H. 1
- Butler Co.
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 4
- Cambria Co., Barnesboro-Patton quadrangles: Campbell, M.R. 8
- Clarion Co., Clarion-Foxburg quadrangles: Shaw, E.W. 4
- Clearfield Co.
  - Barnesboro-Patton quadrangles: Campbell, M.R. 8
  - Curwensville quadrangle: Ashley, G.H. 68
  - Punxsutawney quadrangle: Ashley, G.H. 33
- Fayette Co.: Hickok, W.O. 10
- Greene Co.: Stone, R.W. 33
  - Amity quadrangle: Clapp, F.G. 6
  - Claysville quadrangle: Munn, M.J. 7
- Indiana Co.
  - Barnesboro quadrangle: Campbell, M.R. 8
  - Elders Ridge quadrangle: Stone, R.W. 3
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Jefferson Co.
  - Punxsutawney quadrangle: Ashley, G.H. 33
  - Smicksburg quadrangle: Shaffner, M.N. 3
- Lawrence Co.
  - New Castle quadrangle: De Wolf, F.W. 1
  - Zelienople quadrangle: Richardson, G.B. 12
- Pennsylvania: Ashley, G.H. 76
- Somerset Co., Somerset-Windber quadrangles: Richardson, G.B. 11
- Southwestern: Reeves, F. 1; Stone, R.W. 14
- Tioga Co.: Taylor, R.C. 6
- Venango Co., Foxburg quadrangle: Shaw, E.W. 4
- Washington Co.
  - Amity quadrangle: Clapp, F.G. 6
  - Claysville quadrangle: Munn, M.J. 7
  - Pittsburgh quadrangle: Johnson, M.E. 9
- Western: Ashley, G.H. 40
- Westmoreland Co.
  - Freeport quadrangle: Hughes, H.H. 1
  - Greensburg quadrangle: Johnson, M.E. 8
  - Pittsburgh quadrangle: Johnson, M.E. 9
  - Somerset-Windber quadrangles: Richardson, G.B. 11

SAPPARE, *see* Corundum

SAUCONITE
- Lehigh Co.: Ross, C.S. 3

SCAPOLITE
- Bucks Co.: Leeds, A.R. 2; Morton, S.G. 1
- Chester Co.: Genth, F.A. 26; Tomlinson, W.H. 5
- Philadelphia Co.: Wherry, E.T. 5

SCHEELITE
- Franklin Co.: Williams, G.H. 3

SCHIST, *see also* Metamorphic rocks
- Lancaster Co.
  - albite trends: Ingerson, F.E. 1
  - in diabase: Tomlinson, W.H. 7
- Lehigh Co.: Hall, C.E. 8
- Northampton Co.: Hall, C.E. 8
- Philadelphia Co.: Rand, T.D. 4, 25
- Southeastern: Hunt, T.S. 7
  - Glenarm series: Knopf, E.F.B. 2
  - origin: Keyes, C.R. 3

SCHORL, *see* Tourmaline

SCHUYLKILL COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern

Areal geology
- Panther Creek valley: Richards, W.B. 1
- Schuylkill Co.: Sheafer, P.W. 1

Economic geology
- coal, anthracite: Coxe, E.B. 1; Johnson, W.R. 1; Koehler, H. 1; Lea, I. 2; LeVan, L.A. 1; Parsons, F.W. 1; Richards, W.B. 1; Sheafer, P.W. 4
  - bacteria: Turner, H.G. 3
  - Buck Mtn. field: Althouse, H.W. 2

    Moorea-New Boston area: Lyman, B.S. 2
    Panther Creek field: Ashburner, C.A. 2
    Shippen-Wetherill tract: Lyman, B.S. 5
  iron: Johnson, W.R. 1

Ground water
  Schuylkill Co.: Lohman, S.W. 1

Historical geology
  Ordovician-Pennsylvanian: Sheafer, P.W. 1
  Pennsylvanian: White, C.D. 3
    Eastern Middle anthracite field: Ashburner, C.A. 18
    Moorea-New Boston area: Lyman, B.S. 2
    Panther Creek coal field: Ashburner, C.A. 2; Richards, W.B. 1
    post-Mammoth conglomerate: Lyman, B.S. 4
    Shippen-Wetherill coal tract: Lyman, B.S. 5
    Southern anthracite field: Ashburner, C.A. 18
    Western Middle anthracite field: Ashburner, C.A. 18
  Pleistocene: Williams, E.H. 8
  Silurian, Bloomsburg Formation: Willard, B. 42
  Silurian-Devonian: Mills, J.R. 1
  Silurian-Pennsylvanian: Willard, B. 47

Maps
  Economic
    coal, anthracite: Ashburner, C.A. 17; Lyman, B.S. 3; Sheafer, P.W. 2
      Mammoth seam: Ashburner, C.A. 2
      Tamaqua area: Koehler, H. 1
  Geologic: Lesley, J.P. 46, 63; Sheafer, P.W. 1
    Eastern Middle anthracite field: Ashburner, C.A. 18
    Moorea-New Boston area: Lyman, B.S. 2
    Panther Creek coal basin: Ashburner, C.A. 2
    Southern anthracite field: Ashburner, C.A. 18
    Western Middle anthracite field: Ashburner, C.A. 18

Mineralogy
  alunogen: Reinhold, E.S. 2
  copiapite: Reinhold, E.S. 1
  dickite: Honess, A.P. 4
  lansfordite: Genth, F.A. 23
  nesquehonite: Genth, F.A. 27
  pyrophyllite: Genth, F.A. 13, Taylor, W.J. 3

Paleontology
  amphibian, Pennsylvanian: Leidy, J. 12
  coral reef, Devonian: Willard, B. 30
  insects, Pennsylvanian: Carpenter, F.M. 1
  plants
    Mississippian: Jongmans, W.J. 4, 5
      seeds: Arnold, C.A. 8
    Pennsylvanian: Harlan, R. 2; Jongmans, W.J. 5; White, C.D. 3
      list: Unger, C.W. 1
  reptiles
    Devonian: Lea, I. 4
    Mississippian: Lea, I. 3
    Pennsylvanian, track: Mason, W.D. 1

Physical geology
  Schuylkill water gap: Chance, H.M. 9
  structure: Chance, H.M. 9
    anthracite basins: Lyman, B.S. 8
    Panther Creek coal field: Ashburner, C.A. 2
    Southern anthracite field: Ashburner, C.A. 18

Physiography
  glacial till: Williams, E.H. 8

SCOLECTITE
  Berks Co.: Smith, E.F. 4

SEDIMENTARY ROCKS, *see* individual types

SEDIMENTARY STRUCTURES, *see also* Clay veins, Concretions, Dendrites, and Oolites
  Central, Ordovician limestone: Field, R.M. 1
  cone-in-cone, Erie Co., Devonian: Gresley, W.S. 3
  "desert varnish," Berks Co., Hardyston quartzite: Miller, B.L. 37
  intraformational conglomerate, Lancaster-York Cos.: Walcott, C.D. 7

SERICITE, *see* Mica

SERPENTINE *see also* Metamorphic rocks
  Adams Co., Fairfield-Gettysburg quadrangles: Stose, G.W. 27
  Berks Co.: Genth, F.A. 21
  Bucks Co.: Lewis, H.C. 12
  Chester Co.: Sharples, S.P. 1; Thomas, C.A. 3; Wherry, E.T. 23
    origin: Frazer, P. 34
    State line area: Chester, F.D. 2
  Cumberland Co., Fairfield quadrangle: Stose, G.W. 27
  Delaware Co.: Rand, T.D. 5, 12, 15
    Radnor area: Rand, T.D. 16
    relation to granite: Meier, A.E. 4

- Franklin Co., Fairfield quadrangle: Stose, G.W. 27
- Lancaster Co.: Frazer, P. 29; Leonard, A.G. 1; Prouty, W.F. 1
- Montgomery Co.: Carter, O.C.S. 1; Rand, T.D. 3
  - Lower Merion area: Rand, T.D. 16
- Northampton Co.: Eyerman, J. 6; Merrill, G.P. 4; Peck, F.B. 1, 8; Smith, S. 1
- Philadelphia Co.: Rand, T.D. 4
  - pseudomorphs of dolomite: Lewis, H.C. 29
- Southeastern: Ashley, G.H. 76; Hunt, T.S. 15; Jonas, A.I. 1; Rand, T.D. 18, 23; Schrauf, A. 2
  - origin: Hunt, T.S. 13

SHALE

- Adams Co.: Stose, G.W. 21
- Allegheny Co.
  - Beaver quadrangle: Woolsey, L.H. 3, 4
  - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
- Armstrong Co.
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Shaw, E.W. 4
  - Elders Ridge quadrangle: Stone, R.W. 5
  - Kittanning-Rural Valley quadrangles: Butts, C. 6
- Beaver Co.
  - Beaver quadrangle: Woolsey, L.H. 3, 4
  - Burgettstown quadrangle: Shaw, E.W. 3
  - Zelienople quadrangle: Richardson, G.B. 12
- Bedford Co.
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Blair Co.
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg quadrangle: Butts, C. 20
- Butler Co.
  - Butler-Zelienople quadrangles: Richardson, G.B. 12
  - Foxburg quadrangle: Shaw, E.W. 4
  - Kittanning quadrangle: Butts, C. 6
- Cambria Co.
  - Ebensburg quadrangle: Butts, C. 4
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - southwest: Phalen, W.C. 1
- Clarion Co.
  - Brookville quadrangle: Graeber, C.K. 3
  - Clarion quadrangle: Lines, E.F. 1
  - Clarion-Foxburg quadrangles: Shaw, E.W. 4
  - Kittanning-Rural Valley quadrangles: Butts, C. 6
- Clearfield Co.
  - Curwensville quadrangle: Ashley, G.H. 68
  - western: Ashley, G.H. 4
- Fayette Co.: Hickok, W.O. 10
  - Accident-Grantsville quadrangles: Martin, G.C. 3
- Greene Co.: Stone, R.W. 33
  - Amity quadrangle: Clapp, F.G. 4, 6
  - Claysville quadrangle: Munn, M.J. 7
- Huntingdon Co., Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Indiana Co.
  - Elders Ridge quadrangle: Stone, R.W. 5
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - northeastern: Ashley, G.H. 4
- Jefferson Co., Brookville quadrangle: Graeber, C.K. 3
- Lancaster Co., New Holland quadrangle: Jonas, A.I. 7
- Lawrence Co., Zelienople quadrangle: Richardson, G.B. 12
- Pennsylvania: Leighton, H. 10
  - oil-bearing: Ashley, G.H. 26
- Somerset Co.
  - Accident-Grantsville quadrangles: Martin, G.C. 3
  - Johnstown quadrangle: Phalen, W.C. 3, 4
- Southwestern: Leighton, H. 5; Stone, R.W. 9
- Venango Co., Foxburg quadrangle: Shaw, E.W. 4
- Washington Co.
  - Amity quadrangle: Clapp, F.G. 4, 6
  - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
  - Claysville quadrangle: Munn, M.J. 7
  - Pittsburgh quadrangle: Johnson, M.E. 9
- Western: Ashley, G.H. 40
  - analyses: Emery, A.H. 1
- Westmoreland Co.
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - Pittsburgh quadrangle: Johnson, M.E. 9

SIDERITE, *see also* Iron

- Armstrong Co.: Hamilton, H.V. 1
- Fayette Co.: Lewis, H.C. 6
- Lehigh Co.: Miller, B.L. 44

SILICA, *see also* Sand, Sand and gravel, and Glass sand

- Pennsylvania: Moore, E.S. 4

SILLIMANITE
- (bucholzite), Delaware Co.: Thomson, T. 2

SILURIAN, *see also* Paleozoic
- Bedford Co.: Miller, E. 1; Stevenson, J.J. 8
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Pawpaw quadrangle: Stose, G.W. 12
- Berks Co.: Willard, B. 47
- Blair Co.: Butts, C. 13, 18; Krynine, P.D. 10; Platt, F. 6, 15; Swartz, F.M. 6
  - Hollidaysburg quadrangle: Butts, C. 20
  - Tyrone quadrangle: Butts, C. 18
- Bradford Co.: Torrey, P.D. 3
- Cambria Co.: Miller, E. 1
- Carbon Co.: Ashburner, C.A. 24; Winslow, A. 2
  - Lehigh gap: Ashley, G.H. 32; Chance, H.M. 11
- Central: Krynine, P.D. 7; Rogers, H.D. 4; Swartz, C.K. 4, 5; Swartz, F.M. 5, 7, 20; Willard, B. 46
  - Harrisburg axis: Willard, B. 57
  - McKenzie shale: Swartz, F.M. 2
- Centre Co.: Brown, T.C. 2; D'Invilliers, E.V. 4; Ewing, A.L. 1; Krynine, P.D. 10; Taylor, R.C. 1
  - Tyrone quadrangle: Butts, C. 18
- Clinton Co.: Chance, H.M. 1, 7; Ulmer, L.J. 1
- Columbia Co.: White, I.C. 12
  - oolitic iron ore: Van Ingen, G. 2
- Dauphin Co.: Willard, B. 46, 67
- Erie Co.: Torrey, P.D. 3
- Franklin Co.
  - Chambersburg quadrangle: Stose, G.W. 10
  - Hancock quadrangle: Stose, G.W. 12
- Fulton Co.: Stevenson, J.J. 8
  - Hancock-Pawpaw quadrangles: Stose, G.W. 12
  - Mercersburg quadrangle: Stose, G.W. 10
- Huntingdon Co.: Ashburner, C.A. 3, 4, 6; Butts, C. 13; Miller, E. 1; Ulrich, E.O. 7; White, I.C. 14
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
  - Tyrone quadrangle: Butts, C. 18
- Juniata Co.: D'Invilliers, E.V. 10; Ulrich, E.O. 7
- Lackawanna Co.: White, I.C. 12
- Lancaster Co., Peach Bottom slate: Stose, G.W. 45
- Lehigh Co.: Miller, B.L. 31
  - Lehigh gap: Ashley, G.H. 32
- Luzerne Co.: White, I.C. 12
- McKean Co.: Cathcart, S.H. 8; Phalen, W.P. 6; Torrey, P.D. 3
- Mifflin Co.: D'Invilliers, E.V. 10; Swartz, F.M. 5
- Monroe Co.: O'Neill, W.F. 1; White, I.C. 11; Willard, B. 40
- Montour Co.: White, I.C. 12
- Northampton Co.: Behre, C.H. 4; Miller, B.L. 31; Willard, B. 2
- Northeastern: Miller, B.L. 17; Rogers, H.D. 3, 5; Schuchert, C. 4; Swartz, C.K. 3, 5, 7; Van Ingen, G. 3
  - anthracite region: Ashburner, C.A. 21
  - Medina Formation: Eaton, H.N. 1
  - Shawangunk Formation: Billingsley, P. 1; Willard, B. 1
  - Shawangunk-Medina problem: Grabau, A.W. 8
- Northern: Cathcart, S.H. 11; Fettke, C.R. 8; Taylor, R.C. 5; Torrey, P.D. 3
- Northumberland Co.: White, I.C. 12; Willard, B. 46
- Northwestern: Fettke, C.R. 12, 13, 14; Rittenhouse, G. 3
- Pennsylvania: Conrad, T.A. 2, 3; Eaton, A. 2; Grabau, A.W. 6, 7; Hopkins, T.C. 3; Hunt, T.S. 3; Kay, G.M. 3; Lesley, J.P. 67; Rogers, H.D. 2; Romer, A.S. 1; Schuchert, C. 3, 11, 23; Swartz, C.K. 2, 8; Swartz, F.M. 13, 22; Ulrich, E.O. 1, 5, 6; Ver Wiebe, W.A. 7; Vicaire, A. 1; Willard, B. 51; Willis, B. 8
  - Clinton sand: Swain, J.F. 1
  - continental deposits: Willard, B. 55
  - delta deposits: Grabau, A.W. 11
  - Medina Formation: Chadwick, G.H. 3; Claypole, E.W. 22
  - Shawangunk-Oneida relations: Grabau, A.W. 4
  - Tuscarora Formation: Ulrich, E.O. 4
- Perry Co.: Claypole, E.W. 10, 16; Willard, B. 33
- Pike Co.: White, I.C. 11
- Potter Co.: Torrey, P.D. 3
- Schuylkill Co.: Mills, J.R. 1; Sheafer, P.W. 1; Willard, B. 47
  - Bloomsburg Formation: Willard, B. 42
  - coal: Willard, B. 42
- Snyder Co.: D'Invilliers, E.V. 10
- Southcentral: Aiken, W.E.A. 1
- Southeastern
  - basal unconformity: Stose, G.W. 29
  - Harrisburg axis: Willard, B. 57
- Southwestern: Butts, C. 8; Lafferty, R.C. 1; Rogers, H.D. 3, 4
- Susquehanna Co.: Torrey, P.D. 3
- Tioga Co.: Ashley, G.H. 49; Cathcart, S.H. 6; Fettke, C.R. 7; Torrey, P.D. 3; White, I.C. 25; Willard, B. 6

- Union Co.: D'Invilliers, E.V. 10
- Warren Co.: Johnson, M.E. 7; Torrey, P.D. 3
- Washington Co.: White, I.C. 25
- Wayne Co.: Torrey, P.D. 3
- Western: Ashley, G.H. 51; Bownocker, J.A. 1; Fettke, C.R. 15, 21, 22, 26; Martens, J.H. 1, 2; Rittenhouse, G. 2, 5; Ver Wiebe, W.A. 5
  - sands: Ashley, G.H. 22
- Wyoming Co.: White, I.C. 12
  - popular: Maxwell, V.L. 1

SILVER
- Bradford Co.: Wells, H. 1
- Centre Co., Bellefonte quadrangle: Butts, C. 16
- Chester Co.: Blake, W.P. 5
- Lancaster Co.: Genth, F.A. 4; Jonas, A.I. 5
  - Pequea mine: Foose, R.M. 17
- Montgomery Co.: Carter, O.C.S. 1

SLATE, *see also* Metamorphic rocks
- Adams Co.: Stose, G.W. 21
- Berks Co., northern: Sanders, R.H. 2
- Bucks Co.: Behre, C.H. 5
  - Allentown quadrangle: Miller, B.L. 14
- Eastern: Ashley, G.H. 76; Behre, C.H. 9; Kessler, D.W. 1; Merrill, G.P. 3
- Lancaster Co.: Biemsderfer, G.K. 1; Dale, T.N. 2; Frazer, P. 29; Jonas, A.I. 6; Merriman, M. 1; Sampson, E. 1
  - Peach Bottom slate, Ordovician: Frazer, P. 35
- Lehigh Co.: Behre, C.H. 5; Chance, H.M. 13; Dale, T.N. 1, 2; Merriman, M. 1; Miller, B.L. 44, 46; Peck, F.B. 4; Sanders, R.H. 2; Silliman, B., Jr. 8
  - Allentown quadrangle: Miller, B.L. 14
  - Bangor-Pen Argyl district: Behre, C.H. 8
  - structural petrography: Behre, C.H. 7
- Lycoming Co.: Meyer, A. 5
- Northampton Co.: Behre, C.H. 1, 4, 5, 10; Chance, H.M. 13; Dale, T.N. 2; Merriman, M. 1; Peck, F.B. 4; Sanders, R.H. 2
  - Allentown quadrangle: Miller, B.L. 14
  - Bangor-Pen Argyl district: Behre, C.H. 8
  - structural petrography: Behre, C.H. 7
- Southcentral: Rogers, H.D. 4
- Southeastern: Bates, T.F. 3; Hunt, T.S. 7
- Tioga Co.: Meyer, A. 5
- York Co.: Dale, T.N. 2; Ferguson, E.G.W. 1; Frazer, P. 1, 35; Stose, G.W. 39
  - Hanover-York area: Stose, A.I.J. 1

SMITHSONITE
- Lancaster Co.: Taylor, W.J. 2
- Lehigh Co.: Smith, S. 1

SNYDER COUNTY, *see also* Pennsylvania, and Pennsylvania-Central

Areal geology
- Snyder Co.: Anon. 7; D'Invilliers, E.V. 10

Economic geology
- iron: D'Invilliers, E.V. 10; Earle, R.B. 1
- limestone: D'Invilliers, E.V. 10

Historical geology
- Ordovician-Devonian: D'Invilliers, E.V. 10

Maps
- Geologic: D'Invilliers, E.V. 10; Lesley, J.P. 46

Physical geology
- structure: D'Invilliers, E.V. 10

Physiography
- steam patterns, Cretaceous: Davis, W.M. 6

SOAPSTONE, *see* Talc

SOILS
- Lehigh Co.: Miller, B.L. 44
- Southeastern, origin: Shaw, C.F. 1

SOMERSET COUNTY, *see also* Pennsylvania, Pennsylvania-Southwestern, and Pennsylvania-Western
- meteorites: Gordon, S.G. 12; Merrill, G.P. 6

Areal geology
- Accident quadrangle: Martin, G.C. 3
- Johnstown quadrangle: Phalen, W.C. 3
- Somerset-Windber quadrangles: Richardson, G.B. 11

Economic geology
- cement, Johnstown quadrangle: Phalen, W.C. 3
- clay: Johnson, W.R. 9
  - Accident quadrangle: Martin, G.C. 3
  - Johnstown quadrangle: Phalen, W.C. 3, 4
  - Windber quadrangle: Richardson, G.B. 11
- coal, bituminous: Althouse, H.W. 1, 3; Johnson, W.R. 9; Fulton, J. 1; Jones, H.G. 1; Lesley, J.P. 19; Phalen, W.C. 2; Platt, F. 4; Prosser, A.G. 1; Sisler, J.D. 17, 27

    - Accident quadrangle: Martin, G.C. 3
    - analyses: Campbell, M.R. 10; U.S.G.S. 1
    - Johnstown quadrangle: Phalen, W.C. 3, 4
    - low-volatile content: Lesley, J.P. 14
    - northern: Sisler, J.D. 18
    - Quemahoning field: Kimball, J.P. 2
    - reserves: Reese, J.F. 9
    - Somerset-Windber quadrangles: Richardson, G.B. 11
    - Southampton Twp.: Johnson, W.R. 12
    - southern: Sisler, J.D. 19
  - fire clay: Lesley, J.P. 55
    - Salisbury basin: Prosser, A.G. 1
  - iron: Johnson, W.R. 9
    - Accident quadrangle: Martin, G.C. 3
    - Johnstown quadrangle: Phalen, W.C. 3, 4
    - Southampton Twp.: Johnson, W.R. 12
  - limestone: Johnson, W.R. 9
    - Johnstown quadrangle: Phalen, W.C. 4
    - Somerset quadrangle: Richardson, G.B. 11
    - Southampton Twp.: Johnson, W.R. 12
  - natural gas: Gibbs, H.S. 1
    - Somerset quadrangle: Richardson, G.B. 11
  - petroleum: Carll, J.F. 4; Gibbs, H.S. 1
  - sand, Johnstown quadrangle: Phalen, W.C. 4
  - sandstone, Somerset-Windber quadrangles: Richardson, G.B. 11
  - shale
    - Accident quadrangle: Martin, G.C. 3
    - Johnstown quadrangle: Phalen, W.C. 3, 4
  - stone
    - Accident quadrangle: Martin, G.C. 3
    - Johnstown quadrangle: Phalen, W.C. 3, 4

- *Ground water*
  - Accident-Grantsville quadrangles: Martin, G.C. 1
  - Frostburg quadrangle: Martin, G.C. 2

- *Historical geology*
  - Devonian-Pennsylvanian
    - Accident-Grantsville quadrangles: Martin, G.C. 3
    - Johnstown quadrangle: Phalen, W.C. 3, 4
    - Somerset-Windber quadrangles: Richardson, G.B. 11
  - Mississippian, Mauch Chunk Formation: Stone, R.W. 41, 43
  - Mississippian-Pennsylvanian: Hodge, J.T. 1
  - Pennsylvanian: Fulton, J. 1; Johnson, W.R. 9; Kimball, J.P. 2

- *Maps*
  - Economic
    - Accident-Grantsville quadrangles, mineral resources: Martin, G.C. 3
    - coal, bituminous: Hogg, J.B. 1
    - Johnstown quadrangle, mineral resources: Phalen, W.C. 3, 4
    - Somerset-Windber quadrangles: Richardson, G.B. 11
  - Geologic: Lesley, J.P. 46; Platt, F. 4
    - Accident quadrangle: Martin, G.C. 3
    - Johnstown quadrangle: Phalen, W.C. 3
    - Somerset-Windber quadrangles: Richardson, G.B. 11
  - Structure
    - Accident quadrangle: Martin, G.C. 3
    - Somerset-Windber quadrangles: Richardson, G.B. 11
  - Structure contour
    - Accident quadrangle, Pottsville sandstone, Pennsylvanian: Martin, G.C. 3
    - Johnstown quadrangle, Lower Kittanning coal: Phalen, W.C. 3, 4
    - Somerset quadrangle, Johnstown limestone, Pennsylvanian: Richardson, G.B. 11
    - Somerset-Windber quadrangles, Lower Kittanning coal: Richardson, G.B. 11

- *Paleontology*
  - mammal, Mississippian: Featherstonhaugh, G.W. 1

- *Physical geology*
  - structure
    - northern: Sisler, J.D. 18
    - southern: Sisler, J.D. 19
    - Viaduct anticline: Platt, F. 4

- *Physiography*
  - cave, Shafer Run area: Gorman, J.P. 2
  - terraces, Pleistocene: Stevenson, J.J. 5

- **SPHALERITE**, *see also* Lead
  - Chester Co.: Smith, J.L. 1
  - Lebanon Co.: Genth, F.A. 17
  - Lehigh Co.: Butler, R.D. 1; Fraser, D.M. 3
  - Luzerne Co.: Northup, M.A. 3
  - Montgomery Co.: Boucot, A.J. 1
  - Westmoreland Co.: Hamilton, H.V. 1
  - York Co.: Ehrenfield, C.H. 3; Jandorf, M.L. 3

- **SPHENE**
  - Philadelphia Co., vanadium-bearing: Lewis, H.C. 18

SPINEL
- Delaware Co.: Nicol, W. 1

SPRINGS, *see also* Ground water, and Mineral springs
- Cumberland Co., Boiling Springs: Stone, R.W. 45
- Franklin Co.: Frazer, P. 29
- Huntingdon Co., warm: Stone, R.W. 54
- Lancaster Co.: Frazer, P. 29
- Montgomery Co.: Manners, J. 1
- Pennsylvania: Anon. 33; Fitch, W.E. 1; Fuller, M.L. 8; Mangan, J.W. 1; Meinzer, O.E. 1
  - analyses: Peale, A.C. 1
- Perry Co., warm: Stone, R.W. 54

STALACTITES
- Cumberland Co., iron oxide: Foose, R.M. 9

STAUROLITE
- (staurotide), Philadelphia Co.: Carpenter, G.W. 1

STAUROTIDE, *see* Staurolite

STEATITE, *see* Talc

STELLEROIDEA
- Cumberland Co., Ordovician: Willard, B. 38
- Venango Co., Mississippian: Berry, C.T. 1

STILBITE, *see* Zeolites

STONE, *see also* Building stone, Construction material, and individual types
- Adams Co.: Stose, G.W. 21
  - Fairfield-Gettysburg quadrangles: Stose, G.W. 27
- Allegheny Co., Sewickley quadrangle: Munn, M.J. 5
- Armstrong Co.
  - Kittanning quadrangle: Butts, C. 3
  - Kittanning-Rural Valley quadrangles: Butts, C. 6
- Beaver Co.
  - New Castle quadrangle: De Wolf, F.W. 1
  - Sewickley quadrangle: Munn, M.J. 5
- Bedford Co.: Stevenson, J.J. 8
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg-Huntingdon quadrangles: Butts, C. 20
- Berks Co.: Rand, T.D. 26
- Blair Co.: Butts, C. 10
  - Ebensburg quadrangle: Butts, C. 4
  - Hollidaysburg quadrangle: Butts, C. 20
  - Tyrone quadrangle: Butts, C. 18
- Bucks Co.: Stone, R.W. 23
  - Allentown quadrangle: Miller, B.L. 14
  - Doylestown-Quakertown quadrangles: Bascom, F. 17
  - Easton quadrangle, Precambrian: Bayley, W.S. 2
  - Germantown quadrangle: Bascom, F. 9
  - Honeybrook quadrangle: Bascom, F. 21
  - Trenton quadrangle: Bascom, F. 10
  - Triassic: Lyman, B.S. 7
- Butler Co.
  - Kittanning quadrangle: Butts, 3, 6
  - Sewickley quadrangle: Munn, M.J. 5
- Cambria Co.
  - Ebensburg quadrangle: Butts, C. 4
  - Johnstown quadrangle: Phalen, W.C. 3, 4
- Centre Co.
  - Bellefonte quadrangle: Butts, C. 16
  - Tyrone quadrangle: Butts, C. 18
- Chester Co.
  - Elkton quadrangle: Bascom, F. 13
  - Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  - Norristown quadrangle: Bascom, F. 9
- Clarion Co.
  - Kittanning quadrangle: Butts, C. 3
  - Kittanning-Rural Valley quadrangles: Butts, C. 6
- Crawford Co.: White, I.C. 9
- Cumberland Co., Fairfield quadrangle: Stose, G.W. 27
- Dauphin Co.
  - Middletown quadrangle: Stose, G.W. 33
  - popular: Bolton, F.J. 1
- Delaware Co.: Hall, C.E. 9
  - Chester-Norristown quadrangles: Bascom, F. 9
- Eastern, brownstone: Hopkins, T.C. 2
- Erie Co.: White, I.C. 9
- Fayette Co.: Stevenson, J.J. 5
  - Accident-Grantsville quadrangles: Martin, G.C. 3
  - Masontown-Uniontown quadrangles: Campbell, M.R. 1
- Franklin Co.
  - Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
  - Fairfield quadrangle: Stose, G.W. 27
- Fulton Co.: Stevenson, J.J. 8
- Greene Co.: Stevenson, J.J. 3
  - high-grade sandstone: Ashley, G.H. 16
  - Masontown quadrangle: Campbell, M.R. 1
- Huntingdon Co.
  - Huntingdon-Hollidaysburg quadrangles: Butts, C. 20

  Tyrone quadrangle: Butts, C. 18
Indiana Co.
  Indiana quadrangle: Richardson, G.B. 2
  Johnstown quadrangle: Phalen, W.C. 3, 4
  Latrobe quadrangle: Campbell, M.R. 6
Lancaster Co.
  Honeybrook quadrangle: Bascom, F. 21
  Lancaster quadrangle: Jonas, A.I. 10
Lawrence Co., New Castle quadrangle: De Wolf, F.W. 1
Lebanon Co.
  brownstone, Hummelstown area: D'Invilliers, E.V. 8
  Lancaster quadrangle: Jonas, A.I. 10
Lehigh Co.: Miller, B.L. 44
  Allentown quadrangle: Miller, B.L. 14
Lycoming Co.: Hodge, J.T. 2
McKean Co.: Ashburner, C.A. 14
Montgomery Co.: Carter, O.C.S. 1
  Chester quadrangle: Bascom, F. 9
  Germantown-Norristown quadrangles: Bascom, F. 9
  Triassic: Lyman, B.S. 7
Northeastern: Stone, R.W. 19
Northampton Co.: Miller, B.L. 28
  Allentown quadrangle: Miller, B.L. 14
  Easton quadrangle, Precambrian: Bayley, W.S. 2
Pennsylvania: Downey, M.G. 1; Hawes, G.W. 1; Merrill, G.P. 5; Stone, R.W. 24, 31
  popular: Anon. 36; Merrill, G.P. 2
  reserves: Ashley, G.H. 30
Philadelphia Co.
  Chester-Germantown quadrangles: Bascom, F. 9
  Trenton quadrangle: Bascom, F. 10
Somerset Co., Johnstown quadrangle: Phalen, W.C. 3, 4
Southeastern: Hopkins, T.C. 1
Tioga Co., Elkland-Tioga quadrangles: Fuller, M.L. 3
Warren Co.: Carll, J.F. 4
  Warren quadrangle: Butts, C. 11
Washington Co.: Stevenson, J.J. 3
  Masontown quadrangle: Campbell, M.R. 1
Westmoreland Co.
  Johnstown quadrangle: Phalen, W.C. 3, 4
  Latrobe quadrangle: Campbell, M.R. 6
York Co.: Stose, G.W. 39
  Hanover-York area: Stose, A.I.J. 1

STRENGITE
  (globosite), Cumberland Co.: Gordon, S.G. 9

STRONTIANITE
  Mifflin Co.: Lewis, H.C. 1

STRUCTURAL GEOLOGY, *see* Anticlines, Cleavage, Synclines, Folds and folding, Faults and faulting, Thrusts and thrusting, Joints, and Petrofabrics

SULPHUR, *see also* sulphur-bearing minerals
  Chester Co.: Smith, J.L. 1
  Western
    in coal: Selvig, W.A. 1
    from pyrite: Leighton, H. 2

SULLIVAN COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern

Areal geology
  Sullivan Co.: Platt, F. 9
    Bernice coal field: Ashburner, C.A. 32

Economic geology
  coal, anthracite: Claghorn, C.R. 1
    Bernice basin: Ashburner, C.A. 32
  coal, bituminous: Platt, F. 9
    analyses: Platt, F. 7; U.S.G.S. 1

Historical geology
  Devonian-Pennsylvanian: Platt, F. 9
  Pennsylvanian
    Bernice coal field: Ashburner, C.A. 32
    Pottsville conglomerate: Lyman, B.S. 1

Maps
  Geologic: Lesley, J.P. 46, 47; Platt, F. 9
    Bernice coal basin: Ashburner, C.A. 32
    Loyalsock coal basin: Ashburner, C.A. 32

Physical geology
  structure: Platt, F. 9

Physiography
  Eagle's Mere, Pleistocene, popular: Ashley, G.H. 75
  "ticklish [balanced] rock," popular: Anon. 56

SUNSTONE, *see* Oligoclase

SUSQUEHANNA COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, Pennsylvania-Northeastern, and Pennsylvania-Northern

Areal geology
  Susquehanna Co.: White, I.C. 10

Economic geology
  coal, anthracite: Meredith, T. 1
  flagstone: Stone, R.W. 19
  iron: Meredith, T. 1

Ground water
  Susquehanna Co.: Lohman, S.W. 1

Historical geology
  Cambrian-Pennsylvanian: Torrey, P.D. 3
  Devonian-Pennsylvanian: White, I.C. 10
  Pennsylvanian, Northern anthracite field: Ashburner, C.A. 18

Maps
  Geologic: Lesley, J.P. 46, 47; White, I.C. 10
    Northern anthracite field: Ashburner, C.A. 18

Paleontology
  amphibian, Devonian: Anon. 30; Willard, B. 22
  crustacean, Devonian, Chemung group: Caster, K.E. 9
  fish, Devonian, Chemung Formation: Claypole, E.W. 1
  plants, Devonian, Chemung group: Penhallow, D.P. 1
  snake, Pennsylvanian: Eaton, A. 3

Physiography
  glacial features: Finch, E.H. 1; White, I.C. 10
  glacial lakes: Wilson, J.H. 1
  glacial striae: Thomas, D. 1

SYMPLECTITE
  Delaware Co.: Berman, J. 1

SYNCLINES
  Allegheny Co.: Sisler, J.D. 1; Stevenson, J.J. 4
    Pittsburgh coal: D'Invilliers, E.V. 6; Johnson, M.E. 4
  Armstrong Co.: Sisler, J.D. 2
  Bedford Co.: Stevenson, J.J. 8
  Blair Co.: Platt, F. 15
  Butler Co.: Sisler, J.D. 4
    northern: Chance, H.M. 4
  Cambria Co.: Sisler, J.D. 5
    Barnesboro-Patton quadrangles: Ashley, G.H. 10
  Carbon Co.
    Lehigh River: Winslow, A. 2
    Panther Creek coal basin: Ashburner, C.A. 2
  Centre Co.: D'Invilliers, E.V. 4
    Houtzdale quadrangle: Ashley, G.H. 10
  Clarion Co.: Chance, H.M. 6; Sisler, J.D. 7
  Clearfield Co.
    Barnesboro-Patton quadrangles: Ashley, G.H. 10
    Curwensville-Houtzdale quadrangles: Ashley, G.H. 10
    Punxsutawney quadrangle: Ashley, G.H. 10
  Clinton Co.: Chance, H.M. 7
    across Appalachian structure: Foose, R.M. 3
  Dauphin Co., Cove Mtn.: Seltzer, G.S. 1
  Fayette Co.: Sisler, J.D. 9; Stevenson, J.J. 8
    Pittsburgh coal: D'Invilliers, E.V. 6
    western: Stevenson, J.J. 4
  Greene Co.: Sisler, J.D. 11; Stevenson, J.J. 3
  Indiana Co.: Sisler, J.D. 10
    Barnesboro-Punxsutawney quadrangles: Ashley, G.H. 10
  Jefferson Co.: Platt, W.G. 3; Sisler, J.D. 12
    Punxsutawney quadrangle: Ashley, G.H. 10
  Luzerne Co.
    Lehigh River: Winslow, A. 2
    Wyoming Valley: Ashburner, C.A. 36
  Lycoming Co.: Sherwood, A. 2
  Pennsylvania, relation to mountains: Chittendon, A.P. 1
  Perry Co.
    Cove Mtn.: Seltzer, G.S. 1
    New Bloomfield quadrangle: Cleaves, A.B. 2
  Potter Co.: Sherwood, A. 3
    Oswayo syncline: Platt, F. 10
  Schuylkill Co., Panther Creek coal basin: Ashburner, C.A. 2
  Somerset Co.
    northern: Sisler, J.D. 18
    southern: Sisler, J.D. 19
  Sullivan Co.: Platt, F. 9
  Washington Co.: Sisler, J.D. 15
    Pittsburgh coal: D'Invilliers, E.V. 6
  Westmoreland Co.: Sisler, J.D. 16
    Pittsburgh coal: D'Invilliers, E.V. 6
    western: Stevenson, J.J. 4

TALC
  Bucks Co.: Bayley, W.S. 2
  Delaware Co.: Rand, T.D. 5; Willcox, J. 2
  Northampton Co.: Bayley, W.S. 2; Miller, B.L. 18; Peck, F.B. 1, 5, 8
  Pennsylvania: Ashley, G.H. 76
  Philadelphia Co.: Carpenter, G.W. 1; Rand, T.D. 3, 4
    exfoliating: Lewis, H.C. 9

TENNANTITE
  Lancaster Co.: Taylor, W.J. 1

TERRACES, *see also* Glacial geology
- Beaver Co., Pleistocene: White, I.C. 6
- Butler-Clarion-Venango Cos., Foxburg quadrangle, Allegheny River: Shaw, E.W. 4
- Chester-Delaware-Lancaster Cos., high-level: Lesley, J.P. 33
- Clarion Co., Allegheny River, Pleistocene: Leverett, F. 2
- Crawford-Erie Cos.: White, I.C. 9
- Cumberland-York Cos., Susquehanna River: Mackin, J.H. 1
- Dauphin Co., Susquehanna River: Mackin, J.H. 1; Meyerhoff, H.A. 7; Moss, J.H. 1
- Fayette-Somerset-Westmoreland Cos.: Stevenson, J.J. 5
- Greene-Washington Cos., Pleistocene: Stevenson, J.J. 3
- Lackawanna-Luzerne Cos.: Itter, H.A. 1
- Lancaster Co., Susquehanna River: Mackin, J.H. 1; Meyerhoff, H.A. 7
- Lawrence Co., Beaver River: White, I.C. 5
- Mercer Co., Pleistocene: White, I.C. 7
- Northumberland-Wyoming Cos., Susquehanna River: White, I.C. 12
- Pennsylvania: Stose, G.W. 27; Wright, G.F. 8, 10
  - Cretaceous-Tertiary: Barrell, J. 5
  - post-Cretaceous: Barrell, J. 8
  - Susquehanna River: Bashore, H.B. 2; Peltier, L.C. 2
- Pike Co., Brodhead-Delaware Rivers: White, I.C. 11
- Southeastern: Bascom, F. 14; Dryden, A.L. 1
  - Delaware River: Winchell, N.H. 1
  - Piedmont: Wallace, D.M. 1
  - Tertiary: McGee, WJ 22
- Southwestern: Stevenson, J.J. 6; Stone, R.W. 12
  - Monongahela River: White, I.C. 19
- Tioga Co., Elkland-Tioga quadrangles: Fuller, M.L. 3
- Western: Chamberlin, T.C. 1; Shaw, E.W. 5
  - Beaver-Ohio Rivers: Hice, R.R. 1; King, A.T. 6

TERTIARY, *see also* Cenozoic
- Adams Co.: Frazer, P. 3; Keith, A. 1
- Bedford Co.: Pawpaw quadrangle: Stose, G.W. 12
- Chester Co.: Chester, A.H. 1
- Cumberland Co., Eocene: Conrad, T.A. 5
- Dauphin Co.
  - high-level gravels: Stose, G.W. 26
  - Middletown quadrangle: Stose, G.W. 33
- Delaware Co.
  - Chester-Norristown quadrangles: Bascom, F. 9
- Franklin Co.: Keith, A. 1
  - Chambersburg-Mercersburg quadrangles: Stose, G.W. 10
  - Hancock quadrangle: Stose, G.W. 12
- Fulton Co.
  - Hancock-Pawpaw quadrangles: Stose, G.W. 12
  - Mercersburg quadrangle: Stose, G.W. 10
- Lancaster Co.: Frazer, P. 29
  - gravel: Stose, G.W. 26
  - Middletown quadrangle: Stose, G.W. 33
- Lebanon Co., Middletown quadrangle: Stose, G.W. 33
- Montgomery Co.
  - Germantown quadrangle: Bascom, F. 9
  - lignite: Lewis, H.C. 5, 15
- Pennsylvania: Barrell, J. 5; Braun, E.L. 1; Schuchert, C. 3; Willis, B. 8
- Philadelphia Co: Chester, A.H. 1; Lewis, H.C. 16
  - Germantown quadrangle: Bascom, F. 9
- Southeastern: Dall, W.H. 1; McGee, WJ 2
  - Bryn Mawr gravel: Bascom, F. 15; Lewis, H.C. 14
- Western: Gibson, J.B. 2
- York Co.: Frazer, P. 13; Stose, G.W. 39
  - Middletown quadrangle: Stose, G.W. 33

THORIANITE, *see also* Radioactive minerals
- Montgomery Co.: Gehman, G.W. 1
- Northampton Co.: Wells, R.C. 1

THOROGUMMITE, *see also* Radioactive minerals
- Montgomery Co.: Gehman, G.W. 1

THRUSTS AND THRUST FAULTING, *see also* Faults and faulting
- Berks Co., Reading overthrust: Miller, B.L. 51; Stose, G.W. 36
- Bucks Co., Yardleyville area: Lewis, H.C. 25
- Central, Birmingham thrust: Lesley, J.P. 23
- Chester-Lancaster Cos., Honeybrook uplift: Stose, G.W. 37
- Dauphin Co.: Van Ingen, G. 1
- Lancaster Co., Martic overthrust: Cloos, E. 8
- Lebanon Co., Reading overthrust: Stose, G.W. 36

Lehigh Co., Reading overthrust: Miller, B.L. 51; Stose, G.W. 36, 41
Montgomery Co.: Frazer, P. 36
Northampton Co., Reading overthrust: Miller, B.L. 51
Northeastern, anthracite region: Seidl, E. 1
Southeastern: Jonas, A.I. 9; Keith, A. 4
Martic allocthone: Kay, G.M. 2
Martic overthrust: Bailey, E.B. 2; Cloos, E. 3; Mackin, J.H. 3; Miller, B.L. 22; Stose, G.W. 45

TIOGA COUNTY, *see also* Pennsylvania, Pennsylvania-Northern, and Pennsylvania-Western

Areal geology
Elkland-Tioga quadrangles: Fuller, M.L. 3
Gaines quadrangle: Fuller, M.L. 4
Tioga Co.: Sherwood, A. 1

Economic geology
clay, Tioga quadrangle: Fuller, M.L. 3
coal, bituminous: Hardt, A. 1; Meade, W. 3; Sisler, J.D. 14, 27; Taylor, R.C. 6
analyses: Clemson, T.G. 3
Gaines quadrangle: Fuller, M.L. 4
fire clay: Taylor, R.C. 6
gravel, Gaines quadrangle: Fuller, M.L. 4
iron: Sherwood, A. 1; Taylor, R.C. 6
analyses: Clemson, T.G. 3
Elkland-Tioga quadrangles: Fuller, M.L. 3
Gaines quadrangle: Fuller, M.L. 4
limestone: Taylor, R.C. 6
Gaines quadrangle: Fuller, M.L. 4
manganese: Taylor, R.C. 6
natural gas: Ashley, G.H. 49; Cathcart, S.H. 2, 6; Gaddess, J. 1; Garrett, S.G. 1; Lucke, J.B. 1; Torrey, P.D. 2
Elkland-Tioga quadrangles: Fuller, M.L. 3
Gaines quadrangle: Fuller, M.L. 4
petroleum: Carll, J.F. 9; Cathcart, S.H. 12; Fuller, M.L. 2
Gaines quadrangle: Fuller, M.L. 4
potash: Stone, R.W. 18
sand and gravel, Elkland-Tioga quadrangles: Fuller, M.L. 3
sandstone: Taylor, R.C. 6
stone
Elkland-Tioga quadrangles: Fuller, M.L. 3
Gaines quadrangle: Fuller, M.L. 4

Historical geology
Cambrian-Pennsylvanian: Torrey, P.D. 3
Devonian: Bennett, J. 1; Cathcart, S.H. 2, 3; Harding, R.W. 1; Robinson, J.F. 6; Sherwood, A. 1
Bradford third sand: Krynine, P.D. 4
Devonian-Mississippian: Fettke, C.R. 17
Devonian-Pennsylvanian, Elkland-Tioga quadrangles: Fuller, M.L. 3
Devonian-Pleistocene, Gaines quadrangle: Fuller, M.L. 4
Pennsylvanian: Hardt, A. 1
Silurian-Devonian: Fettke, C.R. 7; Willard, B. 6
Silurian-Mississippian: White, I.C. 25
Silurian-Pennsylvanian: Ashley, G.H. 49; Cathcart, S.H. 6

Maps
Economic
coal, bituminous, Gaines basin: Platt, F. 12
natural gas, Tioga area: Ashley, G.H. 49
Geologic: Lesley, J.P. 46, 47; Sherwood, A. 1
Elkland-Tioga quadrangles: Fuller, M.L. 3
surficial deposits: Fuller, M.L. 3
Gaines quadrangle: Fuller, M.L. 4
surficial deposits: Fuller, M.L. 4
Structure
Bradford area: Fettke, C.R. 18
Gaines quadrangle: Fuller, M.L. 4
Tioga area: Cathcart, S.H. 3
Structure contour
Oriskany sandstone, Devonian: Finn, F.H. 1
northern: Torrey, P.D. 3
Tioga gas field
Oriskany sandstone, Devonian: Cathcart, S.H. 6; Robinson, J.F. 6
Tully limestone, Devonian: Robinson, J.F. 6
Wolf Creek conglomerate, Devonian: Finn, F.H. 1

Mineralogy
quartz: Meyer, A. 4

Paleontology
brachiopods, Devonian: Simpson, G.B. 2
fish, Devonian: Conrad, T.A. 2; Claypole, E.W. 17; Cope, E.D. 8, 12; Gregory, W.K. 2; Hall, J. 1; Leidy, J. 2, 3
mammal, Quaternary: Edwards, T. 1
pelecypod, Silurian: Simpson, G.B. 2
plants, Pennsylvanian: Teschemacher, J.E. 1
sponges, Devonian: Hall, J. 9

Petrology
  Bradford sand, Devonian: Fettke, C.R. 7, 18; Krynine, P.D. 4; Rosenfield, M.A. 1
Physical geology
  faults, Farmington gas fields: Sanders, T.P. 1
  glacial geology
    Elkland-Tioga quadrangles: Fuller, M.L. 3
    Gaines quadrangle: Fuller, M.L. 4
  Grand Canyon of the Susquehanna, popular: Ashley, G.H. 83

TITANITE
  Berks Co.: Brunner, D.B. 1
  Chester Co.: Bruce, A. 1
  Lehigh Co.: Smith, E.F. 3
  Philadelphia Co.: Bruce, A. 1

TITANIUM, *see also* titanium-bearing minerals
  Lancaster Co.: Genth, F.A. 4

TOPAZ
  Northampton Co.: Eyerman, J. 5

TORBERNITE, *see also* Radioactive minerals
  Delaware-Philadelphia Cos.: Wherry, E.T. 2

TOURMALINE
  Central: Stow, M.H. 2
  Chester Co.: Lea, I. 15
  Lehigh Co.: Smith, E.F. 2
  Northampton Co.: Eyerman, J. 6
  (schorl), Philadelphia Co.: Carpenter, G.W. 1

TRACKS AND TRAILS
  amphibians
    Bucks Co., Triassic: Ryan, J.D. 1
    Schuylkill Co., Pennsylvanian: Leidy, J. 12
    Susquehanna Co., Devonian: Willard, B. 22
    Warren Co., Devonian: Marsh, O.C. 1
    Westmoreland Co., Pennsylvanian: King, A.T. 3
  birds, Westmoreland Co., Pennsylvanian: King, A.T. 1; Lyell, C. 3
  dinosaurs
    Adams Co., Triassic: Anon. 41
    Montgomery Co., Triassic: Lyman, B.S. 12
    York Co., Triassic: Hickok, W.O. 10; Wanner, A. 1; Willard, B. 54
    popular: Ashley, G.H. 82
  mammals, Westmoreland Co., Pennsylvanian: King, A.T. 1, 2; Lyell, C. 3
  reptiles
    Allegheny Co., Pennsylvanian: Moore, W.D. 1
    Chester Co., Triassic: Lea, I. 10; Lesley, J.P. 41
    Cumberland Co., Triassic: Willard, B. 19
    Luzerne Co., Pennsylvanian: Lacoe, R.D. 1
    Schuylkill Co.
      Devonian: Lea, I. 4
      Mississippian: Lea, I. 3
      Pennsylvanian: Mason, W.D. 1
    Westmoreland Co., Pennsylvanian: King, A.T. 1; Lyell, C. 3, 4
    York Co., Triassic: Wanner, H.E. 1

TRIASSIC, *see also* Mesozoic
  Adams Co.: Frazer, P. 13; Hickok, W.O. 8; Keith, A. 1; Stose, G.W. 21
    Fairfield-Gettysburg quadrangles: Stose, G.W. 27
    faulting: Stose, G.W. 47
    Hanover quadrangle: Stose, A.I.J. 1
  Berks Co.: D'Invilliers, E.V. 1; Leidy, J. 14
    alluvial fan: McLaughlin, D.B. 3
    New Holland quadrangle: Jonas, A.I. 7
    South Mtn. area: Eaton, H.N. 1
    Spitzenberg conglomerate: Whitcomb, L. 4, 8
  Bucks Co.: Hall, C.E. 7; Lesley, J.P. 65; Lyman, B.S. 7
    Allentown quadrangle: Miller, B.L. 14
    Brunswick shale: McLaughlin, D.B. 2
    continuity of strata: McLaughlin, D.B. 9
    Delaware River area: McLaughlin, D.B. 8
    Doylestown-Quakertown quadrangles: Bascom, F. 17
    facies: McLaughlin, D.B. 10
    Germantown quadrangle: Bascom, F. 9
    Honeybrook-Phoenixville quadrangles: Bascom, F. 21
    Lockatong Formation: McLaughlin, D.B. 7
    Lockatong-Brunswick Formations: McLaughlin, D.B. 6
    Revere area, well-log data: McLaughlin, D.B. 5
    Stockton Formation: McLaughlin, D.B. 7
    Trenton quadrangle: Bascom, F. 10
  Chester Co.: Hartman, M.D. 1; Lesley, J.P. 41

  - Coatesville-West Chester quadrangles: Bascom, F. 18
  - Doe Run-Avondale area: Bliss, E.F. 2
  - Honeybrook-Phoenixville quadrangles: Bascom, F. 21
  - Norristown quadrangle: Bascom, F. 9
- Cumberland Co.: Hickok, W.O. 8
  - Fairfield quadrangle: Stose, G.W. 27
- Dauphin Co., Middletown quadrangle: Stose, G.W. 33
- Delaware Co.: Hall, C.E. 9
  - Radnor area: Rand, T.D. 16
  - West Chester quadrangle: Bascom, F. 18
- Franklin Co.: Keith, A. 1
  - Fairfield quadrangle: Stose, G.W. 27
- Lancaster Co.: Frazer, P. 25, 29
  - Coatesville quadrangle: Bascom, F. 18
  - Honeybrook quadrangle: Bascom, F. 21
  - Lancaster quadrangle: Jonas, A.I. 10
  - lignite: Rogers, W.B. 3
  - McCalls Ferry quadrangle: Jonas, A.I. 5
  - Middletown quadrangle: Stose, G.W. 33
  - New Holland quadrangle: Jonas, A.I. 7
  - South Mtn. area: Eaton, H.N. 1
- Lebanon Co.: Stose, G.W. 22, 23
  - basalt: Stose, G.W. 23
  - Lancaster quadrangle: Jonas, A.I. 10
  - Middletown quadrangle: Stose, G.W. 33
  - South Mtn. area: Eaton, H.N. 1
- Lehigh Co.: Wherry, E.T. 30
  - Allentown quadrangle: Miller, B.L. 14
  - Lower Milford Twp.: Brown, C.W. 1
  - Quakertown quadrangle: Bascom, F. 17
- Montgomery Co.: Hall, C.E. 7; Lyman, B.S. 6, 7, 12; Morningstar, H. 1; Wherry, E.T. 6
  - Brunswick shale: McLaughlin, D.B. 2
  - continuity of strata: McLaughlin, D.B. 9
  - Germantown-Norristown quadrangles: Bascom, F. 9
  - popular: Myers, R.E. 4
  - Quakertown quadrangle: Bascom, F. 17
- Northampton Co.: Willard, B. 65
  - Allentown quadrangle: Miller, B.L. 14
- Perry Co.: Claypole, E.W. 16
- Philadelphia Co.: Hall, C.E. 7; Lewis, H.C. 32
  - Trenton quadrangle: Bascom, F. 10
- Southeastern: Carlston, C.W. 1; Cope, E.D. 2; Dorsey, G.E. 1; Finch, J. 2; Frazer, P. 22, 31; Gilbert, G.K. 1; Hobbs, W.H. 2; Hopkins, T.C. 3; Huene, F. von 2; Lea, I. 7; Lesley, J.P. 67; Lewis, H.C. 38; Lyman, B.S. 6; Miller, B.L. 23; Newberry, J.S. 7; Rand, T.D. 27; Rogers, H.D. 3; Russell, I.C. 1; Schuchert, C. 3, 23; Stevens, R.P. 2; Ver Wiebe, W.A. 8; Watson, E.H. 2; Wherry, E.T. 9, 12, 13; Willis, B. 8
  - border conglomerate: McLaughlin, D.B. 1
  - considered Permian: Lea, I. 13
  - faulting: McLaughlin, D.B. 4
  - glaciation: Wherry, E.T. 13
  - Lockatong Formation: Hawkins, A.C. 1
  - thickness: McLaughlin, D.B. 1
- York Co.: Bissell, M.H. 1; Deming, H.C. 1; Frazer, P. 6, 13, 37; Hickok, W.O. 8; Stose, G.W. 39
  - faults: Stose, G.W. 47
  - Hanover-York quadrangles: Stose, A.I.J. 1
  - McCalls Ferry quadrangle: Jonas, A.I. 5
  - Middletown quadrangle: Stose, G.W. 3

TRILOBITA, *see also* Arthropoda, and Crustacea
- Bedford Co., Ordovician: Haldeman, S.S. 2
- Blair Co., Ordovician: Raymond, P.E. 6
- Carbon Co., Devonian: Willard, B. 43
- Central, Cambrian: Wilson, J.L. 2
- Centre Co., Ordovician: Collie, G.L. 1; Raymond, P.E. 5
- Clinton Co., Ordovician: Whitcomb, L. 1
- Cumberland Co., Ordovician: Raymond, P.E. 8
- Dauphin Co., Ordovician: Secrist, M.H. 1
- Franklin Co., Ordovician: Howell, B.F. 7
- Huntingdon Co., Devonian: Green, J. 1, 2, 3
- Lancaster Co., Cambrian: Dunbar, C.O. 1; Resser, C.E. 3
- Luzerne Co., Pennsylvanian: Ashburner, C.A. 35
- Monroe Co., Devonian: Heilprin, A. 1
- Northwestern, Devonian: Caster, K.E. 1

Pennsylvania
  Devonian: Swartz, F.M. 15; Willard, B. 39
  Ordovician-Devonian: Conrad, T.A. 3
  Paleozoic: Vodges, A.W. 2
Pike Co., Devonian: Heilprin, A.2
York Co., Cambrian: Resser, C.E. 3; Wanner, A. 4

TUFF, *see also* Volcanic rocks
  Adams-Franklin Cos.: Williams, G.H. 2

TYPE SECTIONS of formations and units named from locations within the Commonwealth, *see also* Geologic formations, and individual periods
  Allegheny Formation, Pennsylvanian: Rogers, H.D. 4
  Allegheny group, Mississippian: Sherwood, A. 1
  Allegheny River coal series, Mississippian-Pennsylvanian: Lesley, J.P., *in* Platt, F. 4
  Allegheny sand, Devonian: Sisler, J.D. 28
  Allegheny System, Pennsylvanian: Platt, F. 3
  Allentown limestone, Cambrian: Wherry, E.T. 5
  Alto coal group, Pennsylvanian: Ashburner, C.A. 14
  Analomink red shale, Devonian: Willard, B. 24
  Annville limestone, Cambro-Ordovician: Miller, B.L. 15
  Antes shale, Ordovician: Kay, G.M. 5
  Antes Gap shale, Ordovician, *see* Antes shale
  Appalachian group, Paleozoic: Williams, H.S. 6
  Appalachian series, Paleozoic: Rogers, H.D. 4
  Appalachian system, Paleozoic: Rogers, H.D. 1
  Aquashicola Formation, Silurian: Miller, B.L. 2
  Arendtsville fanglomerate lentil, Triassic: Stose, G.W. 27
  Armenia limestone lentil, Devonian: Williams, H.S. 9
  Athens group, Pennsylvanian: Stevenson, J.J. 20
  Atwell sand, Devonian: Fuller, M.L. 2
  Auroral Series, Ordovician: Rogers, H.D. 25
  Avondale limestone, Precambrian: Frazer, P., *in* Lesley, J.P. 41
  Avondale series, Ordovician: Hawkins, A.C. 2
  Axemann limestone, Ordovician: Ulrich, E.O. 3
  Bakerstown sandstone, Pennsylvanian: Lesley, J.P., *in* White, I.C. 6
  Bald Eagle conglomerate, Ordovician: Grabau, A.W. 7
  Bangor beds, Ordovician: Behre, C.H. 3
  Barree limestone, Silurian: White, I.C. 14
  Barree shale, Silurian: White, I.C. 14
  Barren Measures, Pennsylvanian-Permian: Lesley, J.P. 1
  Barryville member (of Shohola Formation), Devonian: Willard, B. 31
  Barton group, Pennsylvanian: Stevenson, J.J. 4
  Bastard limestone, Devonian: White, I.C. 12
  Beaverdam black shale member (of Needmore shale), Devonian: Willard, B. 53
  Beaver group, *see* Beaver River Formation
  Beaver River Formation, Pennsylvanian: White, I.C. 6
  Bellefonte dolomite, Ordovician: Ulrich, E.O. 3
  Benner limestone, Ordovician: Kay, G.M. 5
  Benwood limestone member (of Monongahela Formation), Pennsylvanian: Campbell, M.R. 2
  Benzette limestone member (of Pocono Formation), Mississippian: Ashburner, C.A. 28
  Berlin group, Pennsylvanian: White, I.C. 6
  Berlin limestone, Pennsylvanian: Platt, F. 4
  Big Bend facies, Devonian: Caster, K.E. 5
  Big Bend gravel, Pleistocene: Williams, E.H. 13
  Bimber Run conglomerate, Devonian-Mississippian: Caster, K.E. 5
  Birmingham shale member (of Conemaugh Formation), Pennsylvanian: Stevenson, J.J. 3
  Bloomfield sandstone, Silurian: Claypole, E.W. 16
  Bloomsburg red beds, Silurian: White, I.C. 12
  Blossburg Formation, Devonian: Fuller, M.L. 2
  Blossburg [red standstone], Devonian: Chadwick, G.H. 5
  Blue Ball fire clay, Pennsylvanian: Chance, H.M. 14
  Bolivar fire clay, Pennsylvanian: White, I.C. 18
  Bolivar sandstone, Pennsylvanian: Stevenson, J.J. 5

Bossardville limestone, Silurian: White, I.C. 11

Bowmanstown chert, Devonian: Swartz, F.M. 10

Brallier shale, Devonian: Butts, C. 13

Branchtown clay, Pliocene?: Lewis, H.C. 16

Bridgeport sandstone, Silurian: Claypole, E.W. 16

Brier Hill sandstone, Permian: Hickok, W.O. 10

Broad Top series, Pennsylvanian: Rogers, H.D. 1

Brodhead Creek member (of Marcellus Formation), Devonian, *see* Brodhead member

Brodhead Creek member (of Tully Formation), Devonian: Stevenson, R.E. 2

Brodhead member (of Marcellus Formation), Devonian: Willard, B. 40

Brunswick conglomerate, Triassic: Wherry, E.T., *in* Miller, B.L. 6

Brush Creek fire clay, Pennsylvanian: Lesley, J. P., *in* White, I.C. 4

Brush Creek limestone member (of Conemaugh Formation), Pennsylvanian: White, I.C. 6

Brush Creek standstone, Pennsylvanian: Lesley, J.P., *in* White, I.C. 6

Bryn Mawr gravel, Pliocene?: Lewis, H.C. 16

Buchanan Hill conglomerate, Devonian-Mississippian: Lesley, J.P. 67, vol. 2

Buck Ridge gneiss, Precambrian: Lesley, J.P. 67, vol. 1

Buffalo Formation, Pennsylvanian: Ashley, G.H. 33

Buffalo sandstone member (of Conemaugh Formation), Pennsylvanian: White, I.C. 6

Buffalo shale, Pennsylvanian: Adams, T.K. 2

Bulger limestone bed (in Monongahela Formation), Pennsylvanian: Griswold, W.T. 2

Burgoon group, Mississippian: Sisler, J.D. 28

Burgoon sandstone member (of Pocono Formation), Mississippian: Butts, C. 3

Burket black shale member (of Harrell shale), Devonian: Butts, C. 13

Burlington limestone, Devonian: Sherwood, A. 1

Butler limestone, *see* Lower Freeport limestone member (of Allegheny Formation)

Butler sandstone member (of Allegheny Formation), Pennsylvanian: White, I.C. 6

Buttermilk Falls limestone, Devonian: Willard, B. 40

Byham limestone member, Mississippian: Caster, K.E. 5

Cadent series, Devonian: Rogers, H.D. 25

Camargo schist, Precambrian: Jonas, A.I. 4

Cameron red shale member, Mississippian: Caster, K.E. 5

Campbell's Ledge black slate, Pennsylvanian: White, I.C. 12

Canadaway group, Devonian: Chadwick, G.H. 6

Canal limestone, Pennsylvanian: Ashburner, C.A. 35

Carl sandstone member (of Shenango Formation), Mississippian: Dickey, P.A. 4

Carlim limestone, Ordovician: Butts, C. 13

Carmichaels Formation, Pleistocene: Campbell, M.R. 1

Cascade Creek sandstone, Devonian: Stevenson, J.J. 12

Cascade sandstone, Devonian: White, I.C. 10

Castanea sandstone, Silurian: Swartz, F.M. 5

Cattasauqua limestone, Ordovician: White, I.C. 11

Center Hall Formation, Ordovician: Field, R.M. 2

Chagrin magnafacies, Devonian: Caster, K.E. 5

Chambersburg limestone, Ordovician: Stose, G.W. 6

Chaneysville sandstone member (of Hamilton Formation), Devonian: Willard, B. 24

Cherry Ridge conglomerate, Devonian-Mississippian: White, I.C. 10

Cherry Ridge group, Devonian-Mississippian: White, I.C. 10

Cherry Ridge limestone, Devonian-Mississippian: White, I.C. 10

Cherry Ridge red shale, Devonian-Mississippian: White, I.C. 10

Cherry Ridge sandstone, Devonian-Mississippian: White, I.C. 10

Cherry Ridge shales, Devonian-Mississippian: White, I.C. 10

Chester County gneiss, Precambrian?: Rand, T.D. 27

Chestnut Hill schist and gneiss, Precambrian: Hall, C.E. 7

Chestnut Ridge sandstone, Mississippian: Laird, W.M. 2

Chickies quartzite, Cambrian: Lesley, J.P. 26

Church Run conglomerate, Pennsylvanian: Carll, J.F. 1

Clarendon gravel, Pleistocene: Williams, E.H. 14

Clarendon sand, Devonian: Carll, J.F. 4

Clarion clay, Pennsylvanian: Platt, W.G. 2

Clarion coal group, Pennsylvanian: Rogers, H.D. 25

Clarion Formation, Pennsylvanian: Ashley, G.H. 33

Clarion sandstone member (of Allegheny Formation), Pennsylvanian: Stevenson, J.J. 5

Clark's Mill beds, Devonian: Claypole, E.W. 16

Claysville limestone member (of Greene Formation), Permian: Griswold, W.T. 2

Clermont group, Pennsylvanian: Ashburner, C.A. 16

Clermont limestone, Pennsylvanian: Ashburner, CA. 14

Cleveland magnafacies, Devonian-Mississippian: Caster, K.E. 5

Clover member (of Loysburg Formation), Ordovician: Kay, G.M. 5

Cobham conglomerate member, Devonian-Mississippian: Caster, K.E. 5

Coburn Formation, Ordovician: Field, R.M. 2

Cocalico shale, Ordovician: Stose, G.W. 18

Codorus limestone, Cambro-Ordovician: Lesley, J.P. 67

Coleman limestone, Pennsylvanian: Platt, F. 4

Colorado conglomerate, Pennsylvanian: Carll, J.F. 1

Conemaugh Formation, Pennsylvanian: Platt, F. 1

Conestoga limestone, Cambrian?-Ordovician: Stose, G.W. 18

Conewago group, Triassic: Ashley, G.H. 44

Conewango clay, Pleistocene, *see* Clarendon gravel

Conewango Formation, Devonian-Mississippian: Butts, C. 8

Conewango series, Devonian-Mississippian: Caster, K.E. 5

Conneaut group, Devonian: Caster, K.E. 5

Conneaut limestone member, Mississippian: Caster, K.E. 5

Connellsville member (of Conemaugh Formation), Pennsylvanian: Johnson, M.E. 9

Connellsville sandstone member (of Conemaugh Formation), Pennsylvanian: Platt, F. 3

Connoquenessing sandstone member (of Pottsville Formation), Pennsylvanian: White, I.C. 6

Conococheague limestone, Cambrian: Stose, G.W. 9

Conshohocken clay, Ordovician or Cretaceous: Hopkins, T.C. 8

Coplay limestone, Ordovician: Wherry, E.T. 5

Cornmeal sand, Pennsylvanian: Lesley, J.P., *in* White, I.C. 6

Cornwall slates, Cambrian: Lesley, J.P. 53

Corry sandstone, Mississippian: White, I.C. 9

Coudersport member (of Cattaraugus Formation), Devonian-Mississippian: Willard, B. 31

Cove limestone, Ordovician: Rogers, H.D. 1

Cove Mountain member (of Pocono Formation), Mississippian: Willard, B. 41

Cove slate, Ordovician: Rogers, H.D. 1

Crandall Hill sand, Devonian: Fettke, C.R. 8

Crawford series, Mississippian: Caster, K.E. 5

Crawford shale, Devonian?-Mississippian: Carll, J.F. 3

Croasdale quartzite, Silurian: Grabau, A.W. 11

Curtin limestone, Ordovician: Kay, G.M. 4

Cussewago limestone, Devonian-Mississippian: Caster, K.E. 3

Cussewago monothem, Devonian-Mississippian: Caster, K.E. 5

Cussewago sandstone, Devonian-Mississippian: White, I.C. 9

Cussewago shales, Devonian-Mississippian: White, I.C. 9

Cussewago stage, Devonian-Mississippian: Caster, K.E. 5

Custards shale member, Mississippian: Caster, K.E. 5

Damascus red shale, Devonian: Willard, B. 31

Darling oil sand, Devonian: Carll, J.F. 4

Darlington plant bed, Pennsylvanian: Lesley, J.P., *in* White, I.C. 6

Darlington shale, *see* Darlington underclay

Darlington underclay, Pennsylvanian: Lesley, J.P., *in* White, I.C. 6

Dauphin shale, Ordovician: Willard, B. 60

Davistown sandstone, Permian: Hickok, W.O. 10
Decker Ferry Formation, *see* Decker limestone
Decker Ferry limestone, *see* Decker limestone
Decker Ferry sandstone, Silurian: White, I.C. 11
Decker Ferry shales, Silurian: White, I.C. 11
Decker limestone, Silurian: White, I.C. 11
Delaware flag series, *see* Delaware River flags
Delaware flags, Devonian: White, I.C. 11
Delaware River flags, Devonian: White, I.C. 11
Dellville sandstone, Devonian: Claypole, E.W. 16
Devils Den sandstone, Devonian-Mississippian: Chadwick, G.H. 6
Dexterville shale member, Devonian: Caster, K.E. 5
Dinsmore limestone bed (in Monongahela Formation), Pennsylvanian: Griswold, W.T. 2
Doe Run limestone, Precambrian: Frazer, P., *in* Lesley, J.P. 41
Donley limestone member (of Greene Formation), Permian: Griswold, W.T. 2
Doylesburg member (of Shippensburg Formation), Ordovician: Craig, L.C. 1
Drinker Creek sandstone member (of Lanesboro formational suite), Devonian: Caster, K.E. 9
Dunkard Creek series, *see* Dunkard group
Dunkard group, Permian: White, I.C. 18
Dunlap sandstone, Permian: Hickok, W.O. 10
Duquesne limestone, Pennsylvanian: Johnson, M.E. 9
Dutchman's conglomerate lens, Devonian-Mississippian: Caster, K.E. 5
Dyberry conglomerate, Devonian: Willard, B. 31
East Kane shale member, Devonian-Mississippian: Caster, K.E. 5
Ebensburg sandstone member (of Conemaugh Formation), Pennsylvanian: Butts, C. 4
Ebensburg oil sandstone, Devonian: Carll, J.F. 4
Edgehill quartzite, Cambrian: Hall, C.E. 7
Elbrook limestone, Cambrian: Stose, G.W. 6
Elizabeth Furnace conglomerate member (of Gettysburg shale), Triassic: Jonas, A.I. 10
Elk Lick limestone member (of Conemaugh Formation), Pennsylvanian: Platt, F. 4
Elk Mountain lower sands, *see* Elk Mountain transition group
Elk Mountain lower shales, *see* Elk Mountain transition group
Elk Mountain sandstone, Devonian-Mississippian: Willard, B. 31
Elk Mountain shales, *see* Elk Mountain transition group
Elk Mountain shales and sandstones, *see* Elk Mountain transition group
Elk Mountain transition group, Devonian-Mississippian: White, I.C. 10
Elk Mountain upper sandstone, *see* Elk Mountain transition group
Eyer member (of Hatter Formation), Ordovician: Kay, G.M. 4
Fagundas conglomerate, Pennsylvanian: Carll, J.F. 1
Fairmount gneiss, Precambrian: Rand, T.D. 16
Fall Creek conglomerate lentil (of Chemung Formation), Devonian: White, I.C. 10
Falling Springs sandstone member (of New Scotland Formation), Devonian: Swartz, F.M. 10
Fannetsburg member (of Shippensburg Formation), Ordovician: Craig, L.C. 1
Ferriferous limestone, *see* Vanport limestone member (of Allegheny Formation)
Fish Creek sandstone member (of Greene Formation), Permian: Stevenson, J.J. 3
Fishpot limestone member (of Monongahela Formation), Pennsylvanian: Stevenson, J.J. 3
Flatiron coquinite member (of Riceville Formation), Devonian: Willard, B. 53
Fort Hunter sandstone member (of Mahantango Formation), Devonian: Willard, B. 53
Fort Littleton Formation, Devonian: Willard, B. 29
Foy's limestone, Pennsylvanian: Lesley, J.P., *in* White, I.C. 5
Frame shale member (of Hamilton Formation), Devonian: Willard, B. 29
Frankford gneiss, Precambrian: Rand, T.D. 27
Franklin limestone, Permian: Stevenson, J.J. 20, pt. 3

Franklindale limestone lentil (of Chemung Formation), Devonian: Williams, H.S. 9
Freeport clay, *see* Upper Freeport clay, and Lower Freeport clay
Freeport coal group, Pennsylvanian: Rogers, H.D. 25, vol. 2
Freeport Formation, Pennsylvanian: Ashley, G.H. 33
Freeport limestone member (of Allegheny Formation), Pennsylvanian: Rogers, H.D. 25, vol. 2
Freeport sandstone member (of Allegheny Formation), Pennsylvanian: Rogers, H.D. 25, vol. 2
French Creek limestone member, Mississippian: Caster, K.E. 5
Gallitzin limestone, Pennsylvanian: Lesley, J.P., *in* Platt, W.G. 2
Gander Run shale member, Devonian: Willard, B. 29
Garland conglomerate, Pennsylvanian: Carll, J.F. 1
Gettysburg shale, Triassic: Jonas, A.I. 7
Gilmore sandstone member (of Greene Formation), Permian: Stevenson, J.J. 3
Girard shale member (of Chemung Formation), Devonian: White, I.C. 6
Glade sandstone, Devonian-Mississippian: Caster, K.E. 3
Gourdhead Run clay, Pennsylvanian: White, I.C. 6
Gourdhead Run limestone, Pennsylvanian: White, I.C. 6
Grafton Formation, Pennsylvanian: Ashley, G.H. 33
Grafton member (of Conemaugh Formation), Pennsylvanian: Johnson, M.E. 9
Graters shales, Triassic: McLaughlin, D.B. 2
Grazier member (of Hatter Formation), Ordovician: Kay, G.M. 4
Great Bend conglomerate, Pennsylvanian: Lesley, J.P. 21
Great Bend limestone, Devonian: White, I.C. 10
Great conglomerate, Pennsylvanian: Lesley, J.P. 1
Great limestone, Pennsylvanian: Rogers, H.D. 3
Greencastle bed, Ordovician: Bassler, R.S. 3
Greene County group, Pennsylvanian-Permian: Rogers, H.D. 25, vol. 2
Greene Formation, Permian: Stevenson, J.J. 3
Griswold conglomerate, Mississippian: White, I.C. 10
Griswold gap conglomerate, Mississippian: White, I.C. 12
Griswolds gap conglomerate, Mississippian: Willard, B. 31
Hanley sandstone, Devonian: Fettke, C.R. 20
Harrell shale, Devonian: Butts, C. 13
Harshberger limestone, Pennsylvanian: Platt, F. 4, pt. 2
Hartley augen gneiss, Precambrian: Knopf, E.F.B. 2
Harvest Home shale member, Mississippian: Caster, K.E. 5
Haskell sand, Devonian: Fettke, C.R. 8
Haskill sand, Devonian, *see* Haskell sand
Hatter limestone, Ordovician: Kay, G.M. 5, pt. 1
Hann's Bridge group, Devonian: White, I.C. 14
Heidlersburg member (of Gettysburg shale), Triassic: Stose, G.W. 27
Hellam conglomerate member (of Chickies quartzite), Cambrian: Stose, G.W. 18
Hellam quartzite, Cambrian: Frazer, P. 37
Hempfield shale member, Mississippian: Caster, K.E. 5
Hillman limestone, Pennsylvanian: Ashburner, C.A. 35
Honesdale sandstone group, Devonian: White, I.C. 10
Hopwood conglomerate, Mississippian: Laird, W.M. 2
Hosmer conglomerate, *see* Hosmer Run conglomerate
Hosmer oil sand, *see* Hosmer Run oil sand
Hosmer Run conglomerate, Devonian-Mississippian: Carll, J.F. 1
Hosmer Run oil sand, Devonian-Mississippian: Carll, J.F. 1
Hosmer sand, *see* Hosmer Run oil sand
Hostler member (of Hatter Formation), Ordovician: Kay, G.M. 4
Housum member (of Mercersburg Formation), Ordovician: Craig, L.C. 1
Howard Quarry sandstone, Devonian: Caster, K.E. 11
Howard sandstone member, *see* Castanea sandstone
Hunterian subseries, Ordovician: Kay, G.M. 6
Indian Hollow sands, *see* Clarendon gravel
Inwood sandstone, Silurian: Swartz, C.K. 5
Jackson limestone, Permian: Stevenson, J.J. 20, pt. 3
Johnson Run sandstone, Pennsylvanian: Ashburner, C.A. 14

Johnsonburg sandstone, Mississippian: Caster, K.E. 5

Johnstown cement bed, *see* Johnstown limestone member

Johnstown iron ore, Pennsylvanian: Sisler, J.D. *in* Miller, B.L. 15

Johnstown limestone member (of Allegheny Formation), Pennsylvanian: Chance, H.M. 6

Jollytown limestone member (of Washington Formation), Permian: White, I.C. 18

Jollytown sandstone, Permian: D'Invilliers, E.V., *in* Lesley, J.P. 67, vol. 3, pt. 2

Jonestown beds, Ordovician, *see* Jonestown Formation

Jonestown Formation, Ordovician: Willard, B. 50

Jumonville sandstone, Devonian: Laird, W.M. 2

Juniata coal measures, Devonian: Platt, F. 4, pt. 1

Juniata River series, Devonian: Platt, F. 1

Kane limestone, Pennsylvanian: Ashburner, C.A. 28

Kane sand, Devonian: Sisler, J.D. 28

Kauffman member (of Mercersburg Formation), Ordovician: Craig, L.C. 1

Kennett limestone, Precambrian: Rand, T.D. 27

Kennett rock, Precambrian: Frazer, P., *in* Lesley, J.P. 41

Kings Mill sandstone, Devonian: Claypole, E.W. 16

Kings Mill shale, Devonian: Claypole, E.W. 16

Kingsley red shale member (of New Milford Formation), Devonian: Willard, B. 31

Kinzers Formation, Cambrian: Stose, G.W. 18

Kinzua Creek sandstone, Pennsylvanian: Ashburner, C.A. 14

Kittanning coal group, Pennsylvanian: Lesley, J.P., *in* Platt, F. 4, pt. 2

Kittanning fire clay, Pennsylvanian: White, I.C. 6

Kittanning Formation, Pennsylvanian, *see* Kittanning coal group

Kittanning sandstone member (of Allegheny Formation), Pennsylvanian: White, I.C. 6

Kittanning shale, Pennsylvanian: White, I.C. 6

Knobsville continental beds, Devonian: Willard, B. 29

Kushequa shale member, Devonian-Mississippian: Caster, K.E. 5

Lackawanna sandstone, Pennsylvanian, *see* Roaring Branch sandstone

Lackawaxen conglomerate, Devonian: White, I.C. 11

Lafayette serpentine, Precambrian: Rand, T.D. 27

Lake Monongahela deposits, Pleistocene: Hice, R.R. 3

Landisburg sandstone, Silurian: Lesley, J.P. 67, vol. 2

Lanesboro member (of New Milford Formation), Devonian: Willard, B. 31

Lansdale shale, Triassic: Lyman, B.S. *in* Lesley, J.P. 67, vol. 3, pt. 2

Larke dolomite, Ordovician: Butts, C. 13

Le Boeuf conglomerate, Devonian-Mississippian: White, I.C. 9

Ledger dolomite, Cambrian: Stose, G.W. 18

Leesport limestone, Ordovician: Stose, G.W. 24

Lehigh limestone, Ordovician: Eckel, E.C. 1

Lehigh Valley cement rock, *see* Lehigh limestone

Lehighton member (of Tully Formation), Devonian: Stevenson, R.E. 2

Leithsville Formation, Cambrian: Wherry, E.T. 5

Lemont argillaceous limestone member (of Carlim Formation), Ordovician: Butts, C. 13

Levant sandstone, *see* Levant series

Levant series, Silurian: Rogers, H.D. 25, vol. 1

Lewis Run sand, Devonian: Sisler, J.D. 28

Lewisburg group, Triassic: Ashley, G.H. 44

Lewiston limestone, Silurian, *see* Lewistown limestone

Lewistown limestone, Silurian: Platt, F. 1

Lewistown limestone and shale, Devonian: Lesley, J.P. *in* Dewees, J.H. 1

Lick Run conglomerate, Mississippian: Laird, W.M. 2

Licking Creek limestone, Devonian: Swartz, F.M. 10

Linderman sandstone, Mississippian: Laird, W.M. 2

Lisbon group, Triassic: Ashley, G.H. 44

Little Pittsburgh limestone, Pennsylvanian: Platt, F. 4, pt. 2

Little Pittsburgh member (of Conemaugh Formation), Pennsylvanian: Johnson, M.E. 9

Littles Corner limestone member, Devonian-Mississippian: Caster, K.E. 3
Llanfair sandstone member (of Allegheny Formation), Pennsylvanian: Butts, C. 4
Logan limestone, Silurian: Lesley, J.P. 67, vol. 2
Logan shale, Silurian: Lesley, J.P. 67, vol. 2
Losh Run shale, Devonian: Willard, B. 25
Lost Creek limestone, Silurian: Lesley, J.P. *in* Dewees, J.H. 1
Lost Run conglomerate, Ordovician: Swartz, F.M. *in* Willard, B. 67, supp.
Lower Freeport limestone member (of Allegheny Formation), Pennsylvanian: Platt, F. 4, pt. 1
Lower Freeport sandstone, Pennsylvanian: Stevenson, J.J. 5
Lower Kittanning limestone, Pennsylvanian: Lesley, J.P. *in* White, I.C. 6
Lower Little Pittsburgh limestone, *see* Little Pittsburgh limestone
Lower Mercer fire clay, Pennsylvanian: Lesley, J.P. *in* White, I.C. 5
Lower Mercer iron shales, Pennsylvanian: White, I.C. 5
Lower Mercer limestone, Pennsylvanian: White, I.C. 5
Lower Pittsburgh limestone member (of Conemaugh Formation), Pennsylvanian: Platt, F. 4, pt. 2
Lower Washington limestone member (of Washington Formation), Permian: Stevenson, J.J. 3
Loyalhanna limestone, Mississippian: Butts, C. 3
Loysburg Formation, Ordovician: Field, R.M. 2
Ludlow conglomerate member, Devonian-Mississippian: Caster, K.E. 3
Ludlow sandstone, Devonian: Lesley, J.P. 67, vol. 2
Luthers Mill coquinite, Devonian: Willard, B. 31
Lykens series, Pennsylvanian: Lesley, J.P. 67, vol. 3, pt. 1
Lytle sand, Devonian: Dickey, P.A. 4
McCoytown sandstone, Silurian: Lesley, J.P., *in* Dewees, J.H. 1
Mahantango Formation, Devonian: Willard, B. 29
Mahoney black shale member, Devonian: Willard, B. 29
Mahoning Formation, Pennsylvanian: Ashley, G.H. 33
Mahoning limestone, Pennsylvanian: Rogers, H.D. 25, vol. 2
Mahoning sandstone member (of Conemaugh Formation), Pennsylvanian: Lesley, J.P. 1
Manayunk mica schists and gneisses, Precambrian: Hall, C.E. 7
Manchester group, Triassic: Ashley, G.H. 44
Mandata Formation, Devonian: Swartz, F.M. 10
Mansfield red beds, Devonian; Lesley, J.P. *in* Carll, J.F. 1
Maple Summit sandstone, Devonian: Laird, W.M. 2
Marshburg slates and shale, Pennsylvanian: Ashburner, C.A. 29
Marvin Creek limestone, Devonian-Mississippian: Ashburner, C.A. 14
Martinsburg limestone, Permian: D'Invilliers, E.V. *in* Lesley, J.P. 67, vol. 3
Matinal series, Ordovician: Rogers, H.D. 25, vol. 1
Mauch Chunk shale, Mississippian: Lesley, J.P. 27
Meadville group, Mississippian: White, I.C. 9
Meadville Lower limestone, Mississippian, *see* Meadville group
Meadville Lower shale, Mississippian, *see* Meadville shale member
Meadville monothem, Mississippian: Caster, K.E. 5
Meadville shale member, Mississippian, *see* Meadville group
Meadville stage, Mississippian: Caster, K.E. 5
Meadville Upper limestone, Mississippian: White, I.C. 7
Meadville Upper shale, Mississippian: *see* Meadville group
Mercer coal group, *see* Mercer shale member
Mercer Formation, Pennsylvanian, *see* Mercer shale member
Mercer group, Pennsylvanian, *see* Mercer shale member
Mercer limestone, Pennsylvanian: Rogers, H.D. 25, vol. 2, pt. 1
Mercer shale member (of Pottsville Formation), Pennsylvanian: Lesley, J.P. *in* White, I.C. 5
Mercersburg Formation, Ordovician: Craig, L.C. 1
Meridian series, Devonian: Rogers, H.D. 25, vol. 1
Mexico sandstone member, Devonian: Willard, B. 25
Middle Freeport limestone, Pennsylvanian, *see* Freeport limestone member
Middle Mahoning sandstone, Pennsylvanian: Platt, W.G. 1

Middle Mercer shales, Pennsylvanian: Lesley, J.P. *in* White, I.C. 5
Middle Washington limestone member (of Washington Formation), Permian: Stevenson, J.J. 3
Mifflintown limestone, Silurian: Lesley, J.P. *in* Dewees, J.H. 1
Milesburg Formation, Devonian: Schuchert, C. 4
Mill Creek limestone, Pennsylvanian: Ashburner, C.A. 35
Mill Creek moraine, Pleistocene: Fuller, M.L. 3
Millers Bluff conglomerate, Devonian-Mississippian: Lesley, J.P. 67, vol. 2
Mines dolomite, Cambrian: Butts, C. 13
Monongahela Formation, Pennsylvanian: Rogers, H.D. 4
Monongahela group, Pennsylvanian, *see* Monongahela Formation
Monongahela River coal series, Pennsylvanian-Permian: Lesley, J.P. *in* Platt, F. 4, pt. 2
Monongahela River series, Pennsylvanian, *see* Monongahela Formation
Monongahela series, Pennsylvanian, *see* Monongahela Formation
Monongahela system, Pennsylvanian: Platt, F. 3
Montalto quartzite member (of Harpers schist), Cambrian: Stose, G.W. 6
Montebello sandstone, Devonian: Claypole, E.W. 16
Montrose red shale, Devonian: White, I.C. 10
Moosic, Devonian: Chadwick, G.H. 5, pt. 1
Moravian Heights Formation, Precambrian: Miller, B.L. 31
Mount Morris limestone member (of Washington Formation), Permian: White, I.C. 18
Mount Pleasant conglomerate, Devonian: White, I.C. 10
Mount Pleasant red shale, Devonian: White, I.C. 10
Mount Savage fire clay, Pennsylvanian, *see* Mount Savage group
Mount Savage group, Pennsylvanian: Ashburner, C.A. 6
Mountain Creek rock, Cambrian: Sanders, R.H. 1
Mountain sand, Devonian: Carll, J.F. 3
Nazareth cement rock, Ordovician: Wherry, E.T. 5
Nazareth limestone, Ordovician, *see* Nazareth cement rock
Nealmont limestone, Ordovician: Kay, G.M. 5
Needmore shale, Devonian: Willard, B. 53
New Galilee clay shale, Pennsylvanian: De Wolf, F.W. 1
New Milford group, Devonian: White, I.C. 10
New Milford sandstone, Devonian, *see* New Milford group
New Milford shale, Devonian, *see* New Milford group
New Oxford Formation, Triassic: Stose, G.W. 27
Newport limestone, Devonian: Lesley, J.P. 67, vol. 2
Newport shales and sandstones, Devonian: Platt, F. 15
Nineveh limestone member (of Greene Formation), Permian: White, I.C. 18
Nineveh sandstone member (of Greene Formation), Permian: White, I.C. 19
Nisky limestone, Ordovician: Wherry, E.T. 5
Nittany dolomite, Ordovician: Ulrich, E.O. 3
Nittany Valley limestone, Ordovician: Chance, H.M. 5
Norristown sandstone, Triassic: D'Invilliers, E.V. 1
Norristown shale, Triassic: Lyman, B.S. 7
North Valley Hill sandstone, Cambrian: Lesley, J.P. 67, vol. 1
North Warren shale member, Devonian-Mississippian: Caster, K.E. 3
Octorara schist, Ordovician: Jonas, A.I. 2
Oil Creek Lake group, Devonian-Mississippian: Lesley, J.P. 67, vol. 3, pt. 1
Oil Lake group, Devonian?-Mississippian: White, I.C. 9
Oley Valley slates, Precambrian: D'Invilliers, E.V. 1
Orangeville shale member (of Cuyahoga Formation), Mississippian: White, I.C. 7
Ore Hill limestone member (of Gatesburg Formation), Cambrian: Butts, C. 13
Owego shale member (of Cayuta monothem), Devonian: Caster, K.E. 9
Packer clay, Pleistocene: Williams, E.H. 3
Palmerton sandstone, Devonian: Swartz, F.M. 10
Patton shale member (of Pocono Formation), Mississippian: Campbell, M.R. 6
Paupack sandstone, Devonian: White, I.C. 10

Paupack shales, Devonian: White, I.C. 10
Paxton Creek conglomerate, Ordovician: Willard, B. 41
Peach Bottom slate, Precambrian: Lesley, J.P. *in* Frazer, P. 29
Pen Argyl beds, Ordovician: Behre, C.H. 3
Perkasie shale, Triassic: Lyman, B.S. 7
Perry Formation, Devonian: Lesley, J.P. 67, vol. 2
Peru limestone, Devonian: Lesley, J.P. *in* Dewees, J.H. 1
Peru sandstone, Devonian: Lesley, J.P. *in* Dewees, J.H. 1
Peters Creek schist, Precambrian: Jonas, A.I. 4
Philadelphia brick clay, Pleistocene: Lewis, H.C. 16
Philadelphia mica schists and gneisses, Precambrian: Hall, C.E. 7
Philadelphia red gravel, Pleistocene: Lewis, H.C. 16
Philson limestone, Pennsylvanian: Platt, F. 4, pt. 2
Phoenixville shale, Triassic: Lyman, B.S. 6
Pickering gneiss, Precambrian: Miller, B.L. 4
Pimple Hill conglomerate, Devonian-Mississippian: Willard, B. 31
Pine Creek member (of Conemaugh Formation), Pennsylvanian: White, I.C. 6
Pine Creek sandstone, Pennsylvanian: Lesley, J.P. *in* Platt, W.G. 2
Pine Knob sandstone, Mississippian: Laird, W.M. 2
Pinesburg member (of Shippensburg Formation), Ordovician: Craig, L.C. 1
Piney Ridge sandstone member (of Chemung Formation), Devonian: Butts, C. 13
Pithole grit, Mississippian: Carll, J.F. 3
Pittsburgh limestone, Pennsylvanian: Rogers, H.D. 25, vol. 2, pt. 1
Pittsburgh member, Pennsylvanian: Johnson, M.E. 9
Pittsburgh sandstone member (of Monongahela Formation), Pennsylvanian: Rogers, H.D. 25, vol. 2
Pittsburgh series, Pennsylvanian: Rogers, H.D. 3
Pleasant Hill limestone, Cambrian: Butts, C. 13
Pocono Formation, Mississippian: Lesley, J.P. 27
Pocono group, Mississippian, *see* Pocono Formation
Potter parvafacies, Devonian-Mississippian: Caster, K.E. 5
Pottstown shale, Triassic: Lyman, B.S. 7
Pottsville Formation, Pennsylvanian: Lesley, J.P. 27
Powellton shale, Pennsylvanian: White, I.C. 14
Primal crystalline schists, Precambrian: Rogers, H.D. 25, vol. 1
Prosperity limestone member (of Greene Formation), Permian: Clapp, F.G. 4
Quakertown coal group, Pennsylvanian. *see* Quakertown group
Quakertown fire clay, Pennsylvanian: White, I.C. 5
Quakertown group, Pennsylvanian: Lesley, J.P. *in* White, I.C. 5
Quakertown shale, Pennsylvanian: White, I.C. 5
Reading sandstone, Cambrian: D'Invilliers, E.V. 1
Redstone limestone member (of Monongahela Formation), Pennsylvanian: Platt, F. 4, pt. 2
Redstone member, Pennsylvanian: Johnson, M.E. 9
Redstone Ridge group, Silurian: Lesley, J.P. 67, vol. 2
Reedsville shale, Ordovician: Ulrich, E.O. 3
Riceville shale member (of Chemung Formation), Devonian: White, I.C. 9
Riddlesburg shale member (of Pocono Formation), Mississippian: Reger, D.B. 1
Ridgway shale member, Devonian-Mississippian: Caster, K.E. 3
Ridley Park granodiorite, age unknown: Postel, A.W. 2
Roaring Branch sandstone, Mississippian: White, I.C. 10
Roaring Branch shales, Mississippian: White, I.C. 10
Robeson conglomerate, Triassic: McLaughlin, D.B. 3
Rockville member (of Skaneatles Formation), Devonian: Willard, B. 17
Rocky Run conglomerate, Devonian: Lesley, J.P. 67, vol. 2
Rodman limestone, Ordovician: Butts, C. 13
Rogersville limestone, Permian: Stevenson, J.J. 20, pt. 3
Roulet conglomerate, Devonian: Ashburner, C.A. 11
Roystown coquinite member, Devonian-Mississippian: Caster, K.E. 5
Rush Formation, Devonian: Willard, B. 29

Rush member (of Tully limestone), Devonian: Willard, B. 18

Salona Formation, Ordovician: Field, R.M. 2

Saltsburg Formation, Pennsylvanian: Ashley, G.H. 33

Saltsburg (Lower) sandstone, Pennsylvanian, *see* Thomas sandstone

Saltsburg member, Pennsylvanian: Johnson, M.E. 9

Saltsburg sandstone member (of Conemaugh Formation), Pennsylvanian: Stevenson, J.J. 5

Sanatoga member, Triassic: McLaughlin, D.B. 2

Saxton conglomerate member (of Chemung Formation), Devonian: Butts, C. 13

Saxton shale, Devonian, Reger, D.B. 1

Scalent limestone, Devonian, *see* Scalent series

Scalent marls, Devonian, *see* Scalent series

Scalent series, Devonian: Rogers, H.D. 25

Schenley red beds, Pennsylvanian: Johnson, M.E. 8

Scranton sandstone, Pennsylvanian: White, I.C. 10

Scrubgrass fire clay, Pennsylvanian: Lesley, J.P. *in* White, I.C. 5

Second Mtn. member (of Pocono Formation), Mississippian: Willard, B. 41

Selinsgrove lower limestone, Devonian: White, I.C. 12

Selinsgrove lower sandstone, Devonian: White, I.C. 12

Selinsgrove shale, Devonian: White, I.C. 12

Selinsgrove upper limestone, Devonian: White, I.C. 12

Selinsgrove upper sandstone, Devonian: White, I.C. 12

Sewickley limestone, Pennsylvanian: Platt, F. 4, pt. 2

Sewickley member, Pennsylvanian: Johnson, M.E. 9

Sewickley sandstone member (of Monongahela Formation), Pennsylvanian: White, I.C. 18

Shamokin black shale member, Devonian: Willard, B. 25

Sharon conglomerate member (of Pottsville Formation), Pennsylvanian: Lesley, J.P. *in* White, I.C. 5

Sharpsville formational suite, Mississippian: Caster, K.E. 5

Sharpsville sandstone member (of Cuyahoga Formation), Mississippian: White, I.C. 7

Sharon shale member (of Pottsville Formation), Pennsylvanian: Rogers, H.D. 25, vol. 2

Shaws sandstone member, Mississippian: Caster, K.E. 5

Sheffield gas sand, *see* Sheffield oil sand

Sheffield oil sand, Devonian: Sisler, J.D. 28

Shenango group, Mississippian: White, I.C. 7

Shenango monothem, Mississippian, *see* Shenango group

Shenango River series, Mississippian, *see* Shenango series

Shenango sandstone, Mississippian: Lesley, J.P., *in* White, I.C. 7

Shenango series, Mississippian-Pennsylvanian: Platt, F. 1

Shenango shale, Mississippian: White, I.C. 7

Shenango stage, Mississippian, *see* Shenango group

Shepherdstown gravel, Pliocene?: Campbell, M.R. 16

Shinersville conglomerate, Pennsylvanian: Platt, F. 9

Shippensburg Formation, Ordovician: Craig, L.C. 1

Shochary sandstone member (of Martinsburg Formation), Ordovician: Willard, B. 51

Shohola Formation, Devonian: Willard, B. 31

Skinners Eddy limestone, Devonian: White, I.C. 12

Sliverville sand, Devonian: Fettke, C.R. 24

Smethport magnafacies, Devonian-Mississippian: Caster, K.E. 5

Smethport oil sand, Devonian-Mississippian: Ashburner, C.A. 14

Smethport shale member (of Knapp Formation), Devonian-Mississippian: Caster, K.E. 3

Smith Corner member (of Lockatong Formation), Triassic: McLaughlin, D.B. 9

Snyder member (of Benner limestone), Ordovician: Kay, G.M. 5

Spitzenberg conglomerate, Triassic: Whitcomb, L. 4

Springfield granodiorite, age unknown: Postel, A.W. 2

Squaw sand, Mississippian: Ashley, G.H. 51

Stacy dolomite member (of Gatesburg Formation), Cambrian: Butts, C. 13

Starrucca sandstone, Devonian: Prosser, C.S. 3

Starrucca shale, Devonian: White, I.C. 10

State Line serpentine, Precambrian: Chester, F.D. 2
Stoneham oil sand, Devonian: Carll, J.F. 3
Stonehenge limestone member (of Beekmantown limestone), Ordovician: Stose, G.W. 9
Stonehengian division, Ordovician: Grabau, A.W. 15, vol. 3
Stony Brook beds, Devonian: White, I.C. 12
Stony Lonesome bed, Devonian-Mississippian: Chadwick, G.H. 6
Stormville conglomerate, Devonian: White, I.C. 11
Stormville hydraulic cement bed, Devonian, *see* Stormville water lime
Stormville limestone, Devonian: White, I.C. 11
Stormville shale, Devonian: White, I.C. 11
Stormville water lime, Devonian: White, I.C. 11
Stover member (of Benner limestone), Ordovician: Kay, G.M. 5
Street Road limestone, Cambrian: Rand, T.D. 27
Stroudsbergian stage, Devonian: Willard, B. 53
sub-Blairsville red shale member (of Chemung Formation), Devonian: Campbell, M.R. 6
Summerhill sandstone member (of Conemaugh Formation), Pennsylvanian: Butts, C. 4
Summit limestone, Pennsylvanian: White, I.C. 5
Summit series, Pennsylvanian: D'Invilliers, E.V. *in* Lesley, J.P. 67, vol. 3, pt. 2
Tanners Hill quarry rock, Devonian-Mississippian: Randall, F.A. *in* Carll, J.F. 4
Tanners Hill red, Devonian-Mississippian: Carll, J.F. 1
Taylortown limestone, Permian: D'Invilliers, E.V. *in* Lesley, J.P. 67, vol. 3, pt. 2
Tenmile limestone, Permian: Stevenson, J.J. 20, pt. 3
Tidioute shale member, Devonian-Mississippian: Caster, K.E. 5
Tioga magnafacies, Devonian-Mississippian: Caster, K.E. 5
Tionesta group, Pennsylvanian: Rogers, H.D. 25, vol. 2, pt. 1
Tionesta iron shales, Pennsylvanian: White, I.C. 5
Tionesta sandstone, Pennsylvanian: Rogers, H.D. 25, vol. 2, pt. 1
Tionesta series, Pennsylvanian: Platt, F. 1
Tomstown dolomite, Cambrian: Stose, G.W. 6
Toughkenamon rock, Precambrian: Frazer, P. *in* Lesley, J.P. 41
Towanda sandstone, Devonian: Sherwood, A. 1
Trimmers Rock sandstone, Devonian: Willard, B. 29
Trough Creek limestone member (of Mauch Chunk Formation), Mississippian: White, I.C. 14
Tucquan gneiss, Precambrian: Lesley, J.P. 67, vol. 1
Tunangwant conglomerate, Devonian-Mississippian: Carll, J.F. 3
Turkey Ridge sandstone member, Devonian: Willard, B. 25
Tyrone conglomerate, Ordovician: Grabau, A.W. 6
Uniontown limestone member (of Monongahela Formation), Pennsylvanian: Platt, F. 4, pt. 2
Uniontown member, Pennsylvanian: Johnson, M.E. 9
Uniontown sandstone member (of Monongahela Formation), Pennsylvanian: White, I.C. 18
University gravel, Pleistocene, *see* Philadelphia red gravel
Upper Cambridge limestone, Pennsylvanian, *see* Cambridge limestone member (of Conemaugh Formation)
Upper Connoquenessing sandstone, Pennsylvanian, *see* Connoquenessing sandstone member
Upper Freeport clay, Pennsylvanian: Stevenson, J.J. 5
Upper Freeport limestone member (of Allegheny Formation), Pennsylvanian: Platt, F. 4, pt. 2
Upper Freeport sandstone, Pennsylvanian, *see* Butler sandstone member
Upper Homewood sandstone, Pennsylvanian, *see* Homewood sandstone member
Upper Kittanning limestone, Pennsylvanian: Stevenson, J.J. 5
Upper Little Pittsburgh limestone, Pennsylvanian, *see* Little Pittsburgh limestone
Upper Mahoning sandstone, Pennsylvanian: Platt, F. 3
Upper Mercer iron shales, Pennsylvanian: White, I.C. 5
Upper Mercer limestone, Pennsylvanian: White, I.C. 5
Upper Pittsburgh limestone member (of Conemaugh Formation), Pennsylvanian: White, I.C. 6

Upper Washington limestone member (of Washington Formation), Permian: Stevenson, J.J. 3
Valentine Formation, Ordovician: Field, R.M. 2
Valley limestone, Cambrian-Ordovician: Frazer, P. *in* Lesley, J.P. 41
Vanport limestone member (of Allegheny Formation), Pennsylvanian: White, I.C. 6
Venango Formation, Devonian: Lesley, J.P. 67, vol. 2
Venango monothem, Devonian-Mississippian: Carll, J.F. 3
Vera Cruz graphite schist, Precambrian: Miller, B.L. 2
Vintage dolomite, Cambrian: Stose, G.W. 18
Warren oil sand group, Devonian: Carll, J.F. 3
Warrior limestone, Cambrian: Butts, C. 13
Washington County group, *see* Washington Formation
Washington Formation, Permian: Stevenson, J.J. 3
Washington reds, Pennsylvanian: Stevenson, J.J. 20, pt. 2
Washington sandstone member (of Washington Formation), Permian: Stevenson, J.J. 3
Watering Trough shale, Devonian: Laird, W.M. 2
Watson sandstone member, Devonian-Mississippian: Caster, K.E. 3
Waynesboro Formation, Cambrian: Stose, G.W. 6
Waynesburg group, Permian?: Rogers, H.D. 25, vol. 2, pt. 1
Waynesburg limestone member (of Monongahela Formation), Pennsylvanian: Stevenson, J.J. 4
Waynesburg member, Pennsylvanian: Johnson, M.E. 9
Weissport member (of Tully Formation), Devonian: Stevenson, R.E. 2
West Fairview member (of Martinsburg Formation), Ordovician: Willard, B. 41
West Mead limestone member, Mississippian: Caster, K.E. 5
Wetmore conglomerate member, Devonian-Mississippian: Caster, K.E. 5
White Spot sandstone, Cambrian: Lesley, J.P. 67, vol. 1
Wild Cat coquinite, Devonian-Mississippian: Caster, K.E. 3
Wilmore sandstone member (of Conemaugh Formation), Pennsylvanian: Butts, C. 4
Wilton's Run limestone belt, Cambrian-Ordovician: Frazer, P. 13
Windy Gap limestone member (of Greene Formation), Permian: White, I.C. 18
Woodglen limestone, Permian: Hickok, W.O. 10
Woods Run limestone, Pennsylvanian: Raymond, P.E. 4
Worthington sandstone member (of Allegheny Formation), Pennsylvanian: Lesley, J.P. *in* Platt, W.G. 2
Wrightsville conglomerate, Devonian-Mississippian: Carll, J.F. 4
Wurtemburg limestone, Pennsylvanian: Lesley, J.P. 22
Wurtemburg sandstone, Pennsylvanian: Lesley, J.P. 22
Wyoming Valley limestone beds, Pennsylvanian: Ashburner, C.A. 35
York County hydromica slates, Cambrian: Lesley, J.P. 67, vol. 1
York schist, Cambrian: Frazer, P. 13
York shale, Cambrian: Walcott, C.D. 8
Youghiogheny sandstone, Devonian: Laird, W.M. 2

UNCONFORMITY
Pennsylvania, Mississippian-Pennsylvanian: Butts, C. 9
Southeastern, Ordovician-Silurian: Stose, G.W. 29
Southwestern, Pennsylvanian: Sherrill, R.E. 2

UNION COUNTY, *see also* Pennsylvania, and Pennsylvania-Central

Areal geology
Union Co.: D'Invilliers, E.V. 10

Economic geology
iron: Dewees, J.H. 1; D'Invilliers, E.V. 10; Earle, R.B. 1
limestone: D'Invilliers, E.V. 10

Historical geology
Ordovician-Devonian: D'Invilliers, E.V. 10

Maps
Geologic: D'Invilliers, E.V. 10; Lesley, J.P. 46; Platt, F. 16
northern: D'Invilliers, E.V. 10

Physical geology
structure: D'Invilliers, E.V. 10

Physiography
stream patterns, Cretaceous: Davis, W.M. 6

UNIONITE, *see* Zoisite

URANINITE, *see also* Radioactive minerals
- Delaware Co.: Wherry, E.T. 2
- Montgomery Co.: Gehman, G.W. 1

URANOPHANE, *see also* Radioactive minerals
- Delaware-Philadelphia Cos.: Wherry, E.T. 2
- Montgomery Co.: Gehman, G.W. 1
- (uranotile), Northampton Co.: Bertrand, J.H. 1

URANOTILE, *see* Uranophane

UVAROVITE
- Lancaster Co.: Shepard, C.U. 3

VARISCITE
- Cumberland Co.: Gordon, S.G. 9

VAUQUELINITE
- Lancaster Co.: Taylor, W.J. 3

VENANGO COUNTY, *see also* Pennsylvania, Pennsylvania-Northwestern, and Pennsylvania-Western
- *Areal geology*
  - Foxburg-Hilliards quadrangles: Shaw, E.W. 4
- *Economic geology*
  - clay, Foxburg quadrangle: Shaw, E.W. 4
  - coal, bituminous: Sisler, J.D. 14, 27
    - Foxburg quadrangle: Shaw, E.W. 2, 4
  - iron, Foxburg quadrangle: Shaw, E.W. 4
  - limestone
    - Foxburg quadrangle: Shaw, E.W. 4
    - southern: Fettke, C.R. 6
  - natural gas: Evans, E.W. 1
    - Foxburg quadrangle: Shaw, E.W. 2, 4
    - Franklin quadrangle: Dickey, P.A. 5; Sherrill, R.E. 5
    - Hilliards quadrangle: Sherrill, R.E. 9
    - Oil City quadrangle: Dickey, P.A. 4, 5
    - Titusville quadrangle: Dickey, P.A. 6
  - petroleum: Carll, J.F. 1, 2, 4, 9; Clark, H.R. 1; Dickey, P.A. 2; Evans, E.W. 1; Nettleton, E.S. 1
    - Foxburg quadrangle: Shaw, E.W. 2, 4
    - Franklin quadrangle: Dickey, P.A. 5; Sherrill, R.E. 5
    - Hilliards quadrangle: Sherrill, R.E. 4, 9
    - Oil City quadrangle: Dickey, P.A. 4, 5
    - Titusville quadrangle: Dickey, P.A. 6
  - sandstone, Foxburg quadrangle: Shaw, E.W. 4
  - shale, Foxburg quadrangle: Shaw, E.W. 4
- *Ground water*
  - Venango Co.: Leggette, R.M. 1
- *Historical geology*
  - Devonian: Dickey, P.A. 3; Hall, J. 4; Nettleton, E.S. 1
    - Hilliards quadrangle: Sherrill, R.E. 9
    - Titusville quadrangle: Dickey, P.A. 2
  - Devonian-Mississippian: Carll, J.F. 1
    - Franklin-Oil City quadrangles: Dickey, P.A. 5
    - Hilliards quadrangle: Sherrill, R.E. 4
    - Titusville quadrangle: Dickey, P.A. 6
  - Devonian-Pennsylvanian: Ashburner, C.A. 28
    - Foxburg quadrangle: Shaw, E.W. 2, 4
    - Franklin quadrangle: Sherrill, R.E. 5
    - Oil City quadrangle: Dickey, P.A. 4
- *Maps*
  - Economic
    - coal, bituminous, Foxburg quadrangle: Shaw, E.W. 2
    - Foxburg quadrangle, mineral resources: Shaw, E.W. 4
    - natural gas
      - Franklin-Oil City quadrangles: Dickey, P.A. 5
      - Hilliards quadrangle: Sherrill, R.E. 9
      - Titusville quadrangle: Dickey, P.A. 6
    - petroleum
      - Franklin-Oil City quadrangles: Dickey, P.A. 5
      - Hilliards quadrangle: Sherrill, R.E. 4, 9
      - Titusville quadrangle: Dickey, P.A. 6; Sherrill, R.E. 7
    - petroleum and gas: Sherrill, R.E. 5
      - Foxburg quadrangle: Shaw, E.W. 2, 4
  - Geologic: Lesley, J.P. 46, 47
    - Foxburg quadrangle: Shaw, E.W. 2, 4
    - Hilliards quadrangle: Shaw, E.W. 4
  - Isopach, Devonian sands: Sherrill, R.E. 5
  - Structure contour
    - Corry sand, Mississippian: Sherrill, R.E. 5
    - Devonian sands: Dickey, P.A. 2; Sherrill, R.E. 5
    - Foxburg quadrangle, Vanport limestone, Pennsylvanian: Shaw, E.W. 2, 4
    - Hilliards quadrangle, Second sand, Devonian: Sherrill, R.E. 4

    - Oil City quadrangle, Devonian sands: Dickey, P.A. 4
- *Paleontology*
  - eurypterids
    - Devonian: Hall, J. 6
    - Mississippian: Hall, J. 7
    - Pennsylvanian: Hall, C.E. 3
  - starfish, Mississippian: Berry, C.T. 1
- *Petrology*
  - Venango sand, Devonian, porosity: Rosenfield, M.A. 1
- *Physiography*
  - glacial geology, Foxburg quadrangle: Shaw, E.W. 4
  - Lake Leverett, Pleistocene: Williams, E.H. 13

VENERITE
- Berks Co.: Hunt, T.S. 5

VERMICULITE
- Chester Co.: Clarke, F.W. 2
- Delaware Co.: Cooke, J.P. 4
- (hallite), Chester Co.: Clarke, F.W. 2; Cooke, J.P. 2; Leeds, A.R. 4
- (jefferisite), Chester Co.: Brush, G.J. 2; Cooke, J.P. 2
- (painterite), Chester Co.: Clarke, F.W. 2
- Pennsylvania: Stone, R.W. 39
- (philadelphite), Philadelphia Co.: Lewis, H.C. 11
- Southeastern: Stone, R.W. 47

VERTEBRATA, *see also* individual classes and types
- Berks Co., Pleistocene, Durham cave fauna: Leidy, J. 16
- Monroe Co., Pleistocene, bone cave fauna: Darton, N.H. 1
- Pennsylvania
  - Pleistocene: Baird, S.F. 1
  - popular: Anon. 53
  - Quaternary: Hay, O.P. 1
  - Silurian-Devonian environments: Romer, A.S. 1
- Southwestern, Pennsylvanian-Permian environments: Case, E.C. 3

VESUVIANITE
- Berks Co.: Brunner, D.B. 1

VOLCANIC ROCKS, *see also* individual types
- Southeastern: Jonas, A.I. 13
- volcanic breccia, Adams-Franklin Cos.: Williams, G.H. 2

VOLCANOES
- Montgomery Co., crater: Goldsmith, E. 3, 4

WARREN COUNTY, *see also* Pennsylvania, Pennsylvania-Northern, Pennsylvania-Northwestern, and Pennsylvania-Western
- *Areal geology*
  - Warren Co.: Carll, J.F. 4
  - Warren quadrangle: Butts, C. 11
- *Economic geology*
  - clay: Carll, J.F. 4
    - Warren quadrangle: Butts, C. 11
  - coal, bituminous: Sisler, J.D. 14, 27
    - Warren quadrangle: Butts, C. 11
  - natural gas
    - Tidioute quadrangle: Cathcart, S.H. 13
    - Titusville quadrangle: Dickey, P.A. 6
    - Warren quadrangle: Butts, C. 11
  - petroleum: Carll, J.F. 2, 4, 9; Dickey, P.A. 2
    - Tidioute quadrangle: Cathcart, S.H. 13; Johnson, M.E. 2, 7
    - Titusville quadrangle: Dickey, P.A. 6
    - Warren quadrangle: Butts, C. 11
  - sand and gravel, Warren quadrangle: Butts, C. 11
  - stone: Carll, J.F. 4
    - Warren quadrangle: Butts, C. 11
- *Ground water*
  - Warren Co.: Leggette, R.M. 1
- *Historical geology*
  - Cambrian-Pennsylvanian: Torrey, P.D. 3
  - Devonian, Titusville quadrangle: Dickey, P.D. 2
  - Devonian-Mississippian: Hall, J. 8
    - Titusville quadrangle: Dickey, P.A. 6
  - Devonian-Pennsylvanian: Carll, J.F. 4; Randall, F.A. 1
    - Tidioute quadrangle: Cathcart, S.H. 13
  - Devonian-Pleistocene, Warren quadrangle: Butts, C. 11
  - Silurian-Devonian: Johnson, M.E. 7
- *Maps*
  - Economic
    - natural gas
      - Tidioute quadrangle: Cathcart, S.H. 13
      - Titusville quadrangle: Dickey, P.A. 6
    - petroleum: Carll, J.F. 4; Lesley, J.P. 51
      - Tidioute quadrangle: Cathcart, S.H. 13
      - Titusville quadrangle: Dickey, P.A. 6; Sherrill, R.E. 7
    - Warren quadrangle, mineral resources: Butts, C. 11

    - Geologic: Carll, J.F. 4; Lesley, J.P. 46, 47
      - Warren quadrangle: Butts, C. 11
    - Structure, Tidioute quadrangle: Cathcart, S.H. 13
    - Structure contour
      - Devonian sands: Dickey, P.A. 2
        - Tidioute quadrangle: Cathcart, S.H. 13
      - Warren quadrangle, Clarendon sand, Devonian: Butts, C. 11
  - *Paleontology*
    - amphibian, Devonian: Marsh, O.C. 1
    - brachiopods, Devonian: Simpson, G.B. 2
    - crinoid, Devonian: Goldring, W. 1
    - echinoid, Devonian-Mississippian: Cooper, G.A. 1
    - eurypterids: Hall, J. 6, 7
    - fossil lists: Randall, F.A. 2
    - gastropods, Devonian: Simpson, G.B. 2
    - pelecypods
      - Devonian: Simpson, G.B. 2
      - Mississippian, Waverly group: Beecher, C.E. 2
    - phyllocarids, Devonian: Beecher, C.E. 6
    - phyllopods, Devonian: Beecher, C.E. 1
    - plants, Devonian: Newberry, J.S. 6
    - sponges, Devonian: Hall, J. 9
    - xiphosuran, Devonian: Beecher, C.E. 5; Eller, E.R. 1
  - *Physiography*
    - Allegheny River
      - drainage changes: Wright, G.F. 14
      - terraces: Wright, G.F. 10
    - glacial history: Wright, G.F. 11
    - Lake Leverett, Pleistocene: Williams, E.H. 13
    - Lake Wright, Pleistocene: Williams, E.H. 13
    - Warren quadrangle, glacial geology: Butts, C. 11

- **WASHINGTON COUNTY**, *see also* Pennsylvania, Pennsylvania-Southwestern, and Pennsylvania-Western
  - well temperature measurements: Van Orstrand, C.E. 1
  - *Areal geology*
    - Amity quadrangle: Clapp, F.G. 4
    - Brownsville quadrangle: Campbell, M.R. 2
    - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
    - Claysville quadrangle: Munn, M.J. 7
    - general: D'Invilliers, E.V. 9
    - Masontown quadrangle: Campbell, M.R. 1
    - northeastern: Leighton, H. 8
    - Pittsburgh quadrangle: Johnson, M.E. 9
    - Rogersville quadrangle: Clapp, F.G. 5
    - Washington Co.: Stevenson, J.J. 3
    - Waynesburg quadrangle: Stone, R.W. 4
  - *Economic geology*
    - building stone: Stevenson, J.J. 3
    - clay: Leighton, H. 5; Stevenson, J.J. 3
      - Amity quadrangle: Clapp, F.G. 4, 6
      - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
      - Claysville quadrangle: Munn, M.J. 7
      - Masontown quadrangle: Campbell, M.R. 1
      - Pittsburgh quadrangle: Johnson, M.E. 9
      - Waynesburg quadrangle: Stone, R.W. 4
    - coal, bituminous: Boileau, J.W. 1; Sisler, J.D. 15, 27; Stevenson, J.J. 3; Wall, J.S. 1
      - Amity quadrangle: Clapp, F.G. 4, 6
      - analyses: U.S.G.S. 1
      - Brownsville quadrangle: Campbell, M.R. 2
      - Burgettstown quadrangle: Griswold, W.T. 1
      - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
      - Claysville quadrangle: Munn, M.J. 7
      - Masontown quadrangle: Campbell, M.R. 1
      - Pittsburgh bed: D'Invilliers, E.V. 6
      - Pittsburgh quadrangle: Johnson, M.E. 9
      - reserves: Reese, J.F. 10
      - Rogersville quadrangle: Clapp, F.G. 5
      - Waynesburg quadrangle: Stone, R.W. 4
    - connate water: Richardson, G.B. 3
    - gravel, Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
    - iron, Waynesburg quadrangle: Stone, R.W. 4
    - limestone: Stevenson, J.J. 3
      - Amity quadrangle: Clapp, F.G. 6
      - Brownsville quadrangle: Campbell, M.R. 2
      - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
      - Claysville quadrangle: Munn, M.J. 7
      - Pittsburgh quadrangle: Johnson, M.E. 9
    - natural gas: Ingham, A.I. 2; Robinson, J.F. 3
      - Amity quadrangle: Clapp, F.G. 4, 6
      - Brownsville quadrangle: Campbell, M.R. 2
      - Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3

Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
Claysville quadrangle: Griswold, W.T. 2; Munn, M.J. 7
Masontown quadrangle: Campbell, M.R. 1
Pittsburgh quadrangle: Johnson, M.E. 9
Rogersville quadrangle: Clapp, F.G. 5
Steubenville quadrangle: Griswold, W.T. 2
Waynesburg quadrangle: Stone, R.W. 4
petroleum: Carll, J.F. 2; Ingham, A.I. 2
Amity quadrangle: Clapp, F.G. 4, 6
Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
Claysville quadrangle: Griswold, W.T. 2; Munn, M.J. 7
McDonald oil field: Ingham, A.I. 3
Masontown quadrangle: Campbell, M.R. 1
North Strabane area: Fettke, C.R. 29
Pittsburgh quadrangle: Johnson, M.E. 9
Rogersville quadrangle: Clapp, F.G. 5
Steubenville quadrangle: Griswold, W.T. 2
Waynesburg quadrangle: Stone, R.W. 4
salt: Phalen, W.C. 6
sand: Stevenson, J.J. 3
Brownsville quadrangle: Campbell, M.R. 2
sand and gravel, Pittsburgh quadrangle: Johnson, M.E. 9
sandstone
Amity quadrangle: Clapp, F.G. 6
Claysville quadrangle: Munn, M.J. 7
Pittsburgh quadrangle: Johnson, M.E. 9
shale: Leighton, H. 5
Amity quadrangle: Clapp, F.G. 4, 6
Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
Claysville quadrangle: Munn, M.J. 7
Pittsburgh quadrangle: Johnson, M.E. 9
stone
Amity quadrangle: Clapp, F.G. 4
Brownsville quadrangle: Campbell, M.R. 2
Masontown quadrangle: Campbell, M.R. 1
Waynesburg quadrangle: Stone, R.W. 4

Ground water
Pittsburgh quadrangle: Johnson, M.E. 9
Washington Co.: Piper, A.M. 1

Historical geology
Devonian, McDonald oil field: Ingham, A.I. 3
Devonian-Pennsylvanian: Anon. 11; Ingham, A.I. 2; White, I.C. 24
Amity quadrangle: Clapp, F.G. 4
Claysville quadrangle: Munn, M.J. 7
Waynesburg quadrangle: Stone, R.W. 4
Devonian-Permian: Munn, M.J. 6
Amity quadrangle: Clapp, F.G. 6
Burgettstown-Steubenville quadrangles: Griswold, W.T. 2
Devonian-Pleistocene
Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
Rogersville quadrangle: Clapp, F.G. 5
Mississippian, Loyalhanna limestone: Linn, A. 1
Mississippian-Pleistocene, Brownsville quadrangle: Campbell, M.R. 2
Pennsylvanian: D'Invilliers, E.V. 6; Emery, B. 1; Stevenson, J.J. 3
Masontown quadrangle: Campbell, M.R. 1
Pittsburgh area: Leighton, H. 8
Pittsburgh quadrangle: Johnson, M.E. 9
Silurian-Pennsylvanian: White, I.C. 25

Maps
Economic
Amity quadrangle, mineral resources: Clapp, F.G. 4, 6
Brownsville quadrangle, mineral resources: Campbell, M.R. 2
Burgettstown-Carnegie quadrangles, mineral resources: Shaw, E.W. 3
Claysville quadrangle, mineral resources: Munn, M.J. 7
coal, bituminous: Stevenson, J.J. 3; Wall, J.S. 1
Masontown quadrangle, mineral resources: Campbell, M.R. 1
petroleum: Ingham, A.I. 2
petroleum and gas
Burgettstown quadrangle: Griswold, W.T. 2; Shaw, E.W. 3
Carnegie quadrangle: Munn, M.J. 6; Shaw, E.W. 3
Claysville quadrangle: Griswold, W.T. 2; Munn, M.J. 7
North Strabane area: Fettke, C.R. 29
Pittsburgh quadrangle: Johnson, M.E. 9

    - Steubenville quadrangle: Griswold, W.T. 2
  - Pittsburgh quadrangle, mineral resources: Johnson, M.E. 9
  - Rogersville quadrangle, mineral resources: Clapp, F.G. 5
  - Waynesburg quadrangle, mineral resources: Stone, R.W. 4
- Geologic: D'Invilliers, E.V. 9; Lesley, J.P. 46, 47; Stevenson, J.J. 3, 5
  - Amity quadrangle: Clapp, F.G. 4
  - Brownsville quadrangle: Campbell, M.R. 2
  - Burgettstown-Carnegie quadrangles: Shaw, E.W. 3
  - Claysville quadrangle: Munn, M.J. 7
  - Masontown quadrangle: Campbell, M.R. 1
  - Pittsburgh quadrangle: Johnson, M.E. 9
  - Rogersville quadrangle: Clapp, F.G. 5
  - Waynesburg quadrangle: Stone, R.W. 4
- Isopach, Gordon sand, Devonian: Ingham, A.I. 3
- Structure, Masontown quadrangle: Campbell, M.R. 1
- Structure contour
  - Amity quadrangle, Pittsburgh coal: Clapp, F.G. 4
  - Burgettstown quadrangle, Pittsburgh coal: Griswold, W.T. 1, 2; Shaw, E.W. 3
  - Carnegie quadrangle
    - Gordon sand, Devonian: Munn, M.J. 6
    - Pittsburgh coal: Shaw, E.W. 3
  - Claysville quadrangle
    - Gordon sand, Devonian: Griswold, W.T. 2; Munn, M.J. 7
    - Washington Formation, Permian: Griswold, W.T. 2; Munn, M.J. 7
  - Fifth sand, Devonian: Ingham, A.I. 2
  - Gordon sand, Devonian: Ingham, A.I. 2
  - Hopper field, Fourth sand, Devonian: Ingham, A.I. 2
  - McDonald oil field: Ingham, A.I. 3
  - Masontown quadrangle, Pottsville sandstone, Pennsylvanian: Campbell, M.R. 1
  - Mississippian sands: Ingham, A.I. 2
  - Moon Run-Crafton fields, Fourth sand, Devonian: Ingham, A.I. 2
  - Pennsylvanian sands: Ingham, A.I. 2
  - Pittsburgh coal: Clapp, F.G. 5; Ingham, A.I. 2
  - Pittsburgh quadrangle, Pittsburgh coal: Johnson, M.E. 9
  - Steubenville quadrangle
    - Berea sand, Mississippian: Griswold, W.T. 2
    - Pittsburgh coal: Griswold, W.T. 2
  - Venice field, Fourth sand, Devonian: Ingham, A.I. 2
  - Waynesburg quadrangle, Pittsburgh coal: Stone, R.W. 4

- *Paleontology*
  - plants
    - Pennsylvanian: Darrah, W.C. 6
    - Permian: Darrah, W.C. 4

- *Petrology*
  - coal, bituminous: Theissen, R. 4

- *Physical geology*
  - structure: Sisler, J.D. 15; Stevenson, J.J. 3

- *Physiography*
  - Masontown quadrangle, Pleistocene: Campbell, M.R. 1
  - terraces, Pleistocene: Stevenson, J.J. 3

WATER AND WIND GAPS
- Berks Co., Schuylkill gap: Chance, H.M. 9
- Eastern, age: Ver Steeg, K. 5
- Lehigh Co.: Miller, B.L. 45
  - Lehigh gap: Chance, H.M. 13
  - Leiberts gap: Myers, R.E. 3, 7
- Monroe Co.: Wright, F.B. 1
  - Delaware gap: Chance, H.M. 10; Stose, G.W. 14; Walter, E. 1
  - Wind gap: Mackin, J.H. 5
- Northampton Co.: Miller, B.L. 36; Mitchill, S.L. 1; Preston, S. 1; Volney, C.F. 1; Willard, B. 52
  - Delaware gap: Brodhead, L.W. 1; Chance, H.M. 10, 13; Stose, G.W. 14; Walter, E. 1
  - Schuylkill gap: Chance, H.M. 13
  - Wind gap: Mackin, J.H. 5
- Pennsylvania: Meyerhoff, H.A. 2; Ver Steeg, K. 2, 3; Wilson, J.W. 1
  - effect on geographic development: Willard, B. 58
- Schuylkill Co., Schuylkill gap: Chance, H.M. 9

WAVELLITE
- Chester Co.: Gordon, S.G. 8; Hermann, R. 5
- Cumberland Co.: Gordon, S.G. 8, 9
- Lehigh Co.: Gordon, S.G. 8; Smith, E.F. 1, 2
- Northampton Co.: Wherry, E.T. 21

WAYNE COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, Pennsylvania-Northern, and Pennsylvania-Northeastern

Areal geology
  - Wayne Co.: White, I.C. 10

Economic geology
  - flagstone: Stone, R.W. 19
  - iron: Davis, J.P. 1
  - coal, Devonian: Beck, T.R. 1

Ground water
  - Wayne Co.: Lohman, S.W. 1

Historical geology
  - Cambrian-Pennsylvanian: Torrey, P.D. 3
  - Devonian: Davis, J.P. 1; Prosser, C.S. 3
  - Devonian-Pennsylvanian: White, I.C. 10
  - Pennsylvanian, Northern anthracite field: Ashburner, C.A. 18

Maps
  - Geologic: Lesley, J.P. 46, 47; White, I.C. 10
    - Northern anthracite field: Ashburner, C.A. 18
  - Physiographic, glacial features: White, I.C. 11

Physiography
  - glacial geology
    - Elk Mtn.: Branner, J.C. 3
    - Mt. Ararat: Kummel, H.B. 1
    - Sugarloaf Mtn.: Kummel, H.B. 1

WEATHERING
  - Adams Co., diabase: Frazer, P. 8
  - Berks Co. limestone: Miller, B.L. 16
  - Northeastern, Pottsville conglomerate: Winslow, A. 1
  - Pennsylvania, proof of antiquity: Hunt, T.S. 12

WELLS AND WELL LOGS, *see also* Ground water, Natural gas, Petroleum, and individual geologic time units
  - Allegheny Co.: Carll, J.F. 4, 9
    - Boyds Hill well: Lesley, J.P. 27
    - Carnegie quadrangle, Devonian-Mississippian: Munn, M.J. 6
    - Devonian-Pennsylvanian: White, I.C. 20
    - Freeport quadrangle: Hughes, H.H. 1
    - Mississippian: Phalen, W.C. 6
    - Pittsburgh area, Devonian-Pennsylvanian: Lesley, J.P. 27
    - Pleistocene: Adamson, J.H. 3
    - Sewickley quadrangle: Munn, M.J. 4
    - temperature: Watson, T.L. 1
  - Armstrong Co.: Carll, J.F. 2
    - Clarion quadrangle, Devonian-Mississippian: Munn, M.J. 3
    - Devonian-Pennsylvanian: Lesley, J.P. 11
    - Freeport quadrangle: Hughes, H.H. 1
    - Kittanning-Rural Valley quadrangles, Devonian: Butts, C. 6
  - Beaver Co.: Carll, J.F. 2, 4, 7, 9
    - New Castle quadrangle: De Wolf, F.W. 1
    - Sewickley quadrangle: Munn, M.J. 4
    - Zelienople quadrangle, Devonian-Pennsylvanian: Richardson, G.B. 12
  - Bucks Co., Revere area, Triassic: Lesley, J.P. 65
  - Butler Co.: Carll, J.F. 2, 4, 7, 9
    - Butler quadrangle, Devonian-Pennsylvanian: Richardson, G.B. 12
    - Hilliards quadrangle, Devonian: Sherrill, R.E. 4
    - Kittanning quadrangle, Devonian. Butts, C. 6
    - Sewickley quadrangle: Munn, M.J. 4
    - Zelienople quadrangle, Devonian-Pennsylvanian: Richardson, G.B. 12
  - Cambria Co.: Carll, J.F. 4, 9
    - Johnstown area, Pennsylvanian: Fulton, J. 2
    - Song Hollow area, Devonian: Fulton, J. 2
  - Cameron Co.: Carll, J.F. 4
  - Chester Co., Ordovician: Lesley, J.P. 62
  - Clarion Co.: Carll, J.F. 2, 4, 7, 9
    - Clarion quadrangle, Devonian-Mississippian: Munn, M.J. 3
    - Devonian-Pennsylvanian: Chance, H.M. 6
    - Kittanning-Rural Valley quadrangles, Devonian: Butts, C. 6
    - Oil City quadrangle, Devonian-Pennsylvanian: Dickey, P.A. 4
  - Clearfield Co.: Carll, J.F. 9
    - Pennsylvanian: Hale, J.M. 1
  - Clinton Co.: Carll, J.F. 4
    - Devonian-Pennsylvanian: Chance, H.M. 2
  - Crawford Co.: Carll, J.F. 2, 4, 9
    - Devonian: Dickey, P.A. 2
  - Delaware Co., Ordovician: Carter, O.C.S. 2
  - Elk Co.: Carll, J.F. 4, 7, 9
    - Devonian-Mississippian: Ashburner, C.A. 8
  - Erie Co.: Carll, J.F. 4,9
  - Fayette Co.: Carll, J.F. 7, 9
    - Devonian: Fettke, C.R. 23
  - Forest Co.: Carll, J.F. 4, 7, 9
    - Devonian: Dickey, P.A. 2
    - Oil City quadrangle, Devonian-Pennsylvanian: Dickey, P.A. 4

  - Tidioute quadrangle, Devonian: Cathcart, S.H. 13
- Greene Co.: Carll, J.F. 4, 7, 9
  - Amity quadrangle, Devonian-Permian: Clapp, F.G. 6
  - Devonian-Pennsylvanian: Stone, R.W. 8
  - temperatures: Van Orstrand, C.E. 1
- Indiana Co.: Carll, J.F. 7, 9
- Jefferson Co.: Carll, J.F. 4, 7, 9
- Lackawanna Co., Pennsylvanian: Sheafer, P.W. 5
- Lawrence Co.: Carll, J.F. 2
  - New Castle quadrangle: De Wolf, F.W. 1
  - Zelienople quadrangle, Devonian-Pennsylvanian: Richardson, G.B. 12
- Luzerne Co., Pennsylvanian: Sheafer, P.W. 6
- McKean Co.: Carll, J.F. 2, 4, 7, 9
  - Devonian: Fettke, C.R. 28
  - Devonian-Mississippian: Ashburner, C.A. 8
  - Silurian: Phalen, W.C. 6
- Mercer Co.: Carll, J.F. 2, 4, 9
- Montgomery Co., Cambrian-Triassic: Carter, O.C.S. 2
- Northern, Silurian-Devonian: Fettke, C.R. 8
- Northwestern, Devonian-Pennsylvanian: Lesley, J.P. 51
- Pennsylvania: Fuller, M.L. 9
  - Ordovician-Devonian: Cathcart, S.H. 7
  - temperatures at depth: Van Orstrand, C.E. 2
  - water well records: Darton, N.H. 3
- Philadelphia Co., Ordovician: Carter, O.C.S. 2
- Potter Co.: Carll, J.F. 4, 7, 9
  - Abbott Twp., Devonian-Mississippian: Ashburner, C.A. 30
  - Devonian: Bennett, J. 1; Cathcart, S.H. 5, 12
  - East Fork-Wharton fields, Devonian-Pennsylvanian: Ebright, J.R. 1
  - West Branch Twp., Devonian-Mississippian: Ashburner, C.A. 30
- Somerset Co.: Carll, J.F. 4
- Southeastern, ground water: Disbrow, L. 1
- Southwestern
  - deep: White, I.C. 27
  - Devonian-Mississippian: Matteson, L.S. 1
- Tioga Co.: Carll, J.F. 9
  - Devonian: Ashley, G.H. 49; Bennett, J. 1; Cathcart, S.H. 3, 6, 12; Robinson, J.F. 5
  - Silurian-Devonian: Fettke, C.R. 7
- Venango Co.: Carll, J.F. 2, 4, 7, 9
  - Devonian: Dickey, P.A. 2; Hall, J. 4; Nettleton, E.S. 1
  - Hilliards quadrangle: Sherrill, R.E. 4
  - Oil City quadrangle, Pennsylvanian: Dickey, P.A. 4
- Warren Co.: Carll, J.F. 2, 4, 7, 9
  - Devonian: Dickey, P.A. 2
  - Tidioute quadrangle: Cathcart, S.H. 13; Johnson, M.E. 7
- Washington Co.: Carll, J.F. 9
  - Amity quadrangle, Devonian-Permian: Clapp, F.G. 6
  - Carnegie quadrangle, Devonian-Mississippian: Munn, M.J. 6
  - Devonian-Pennsylvanian: Anon. 11; White, I.C. 24
  - temperatures: Van Orstrand, C.E. 1
- Western: Carll, J.F. 7; Moyer, F.T. 1
  - Devonian: Bennett, J. 1; Lesley, J.P. 29; Platt, F. 2
  - Devonian-Mississippian: Lesley, J.P. 9
  - Devonian-Pennsylvanian: Lesley, J.P. 8
  - Ordovician-Pennsylvanian: Martens, J.H. 1, 2
  - saline: Richardson, G.B. 4
  - Silurian-Pennsylvanian: White, I.C. 25
- Westmoreland Co.: Carll, J.F. 2, 7, 9
  - Freeport quadrangle: Hughes, H.H. 1

WERNERITE
- Bucks Co.: Leeds, A.R. 10
- Montgomery Co.: Gehman, G.W. 1

WESTMORELAND COUNTY, *see also* Pennsylvania, Pennsylvania-Southwestern, and Pennsylvania-Western

Areal geology
- Connellsville quadrangle: Campbell, M.R. 2
- Freeport quadrangle: Hughes, H.H. 1
- general: D'Invilliers, E.V. 9
- Greensburg quadrangle: Johnson, M.E. 8
- Johnstown quadrangle: Phalen, W.C. 3
- Latrobe quadrangle: Campbell, M.R. 6
- Ligonier Valley: Stevenson, J.J. 5
- New Kensington quadrangle: Richardson, G.B. 9
- Pittsburgh quadrangle: Johnson, M.E. 9
- Somerset quadrangle: Richardson, G.B. 11
- western: Leighton, H. 8; Stevenson, J.J. 4

Economic geology
  cement: Stevenson, J.J. 5
    Johnstown quadrangle: Phalen, W.C. 3
  clay: Leighton, H. 5; Stevenson, J.J. 5
    Freeport quadrangle: Hughes, H.H. 1
    Greensburg quadrangle: Johnson, M.E. 8
    Johnstown quadrangle: Phalen, W.C. 3, 4
    Latrobe quadrangle: Campbell, M.R. 6
    Pittsburgh quadrangle: Johnson, M.E. 9
  coal, bituminous: Phalen, W.C. 2; Platt, F. 3; Rayburn, J.M. 1; Sisler, J.D. 16, 27; Stevenson, J.J. 4, 5; Wall, J.S. 1
    Connellsville quadrangle: Campbell, M.R. 2
    Freeport quadrangle: Hughes, H.H. 1
    Greensburg quadrangle: Johnson, M.E. 8
    Johnstown quadrangle: Phalen, W.C. 3, 4
    Latrobe quadrangle: Campbell, M.R. 6
    New Kensington quadrangle: Richardson, G.B. 9
    Pittsburgh bed: D'Invilliers, E.V. 6
    Pittsburgh quadrangle: Johnson, M.E. 9
    reserves: Reese, J.F. 11
    Somerset quadrangle: Richardson, G.B. 11
  fire clay: Platt, F. 3
  iron: Platt, F. 3; Stevenson, J.J. 4, 5
    Freeport quadrangle: Hughes, H.H. 1
    Johnstown quadrangle: Phalen, W.C. 3, 4
  limestone: Stevenson, J.J. 5
    Connellsville quadrangle: Campbell, M.R. 2
    Freeport quadrangle: Hughes, H.H. 1
    Greensburg quadrangle: Johnson, M.E. 8
    Johnstown quadrangle: Phalen, W.C. 4
    Latrobe quadrangle: Campbell, M.R. 6
    Pittsburgh quadrangle: Johnson, M.E. 9
    Somerset quadrangle: Richardson, G.B. 11
  marl: Dickey, F.B.R. 1
  natural gas: Lesley, J.P. 34, 66; Robinson, J.F. 2; Stevenson, J.J. 5
    Connellsville quadrangle: Campbell, M.R. 2
    Freeport quadrangle: Hughes, H.H. 1
    Greensburg quadrangle: Johnson, M.E. 8
    Latrobe quadrangle: Campbell, M.R. 6
    New Kensington quadrangle: Richardson, G.B. 9
    Pittsburgh quadrangle: Johnson, M.E. 9
  nitrate: Mansfield, G.R. 1
  petroleum: Carll, J.F. 2, 9
    Freeport quadrangle: Hughes, H.H. 1
    Greensburg quadrangle: Johnson, M.E. 8
    New Kensington quadrangle: Richardson, G.B. 9
    Pittsburgh quadrangle: Johnson, M.E. 9
  salt: Stevenson, J.J. 5
    Latrobe quadrangle: Campbell, M.R. 6
  sand
    Connellsville quadrangle: Campbell, M.R. 2
    Johnstown quadrangle: Phalen, W.C. 4
    Latrobe quadrangle: Campbell, M.R. 6
  sand and gravel
    Freeport quadrangle: Hughes, H.H. 1
    Pittsburgh quadrangle: Johnson, M.E. 9
  sandstone
    Freeport quadrangle: Hughes, H.H. 1
    Greensburg quadrangle: Johnson, M.E. 8
    Pittsburgh quadrangle: Johnson, M.E. 9
    Somerset quadrangle: Richardson, G.B. 11
  shale: Leighton, H. 5
    Johnstown quadrangle: Phalen, W.C. 3, 4
    Pittsburgh quadrangle: Johnson, M.E. 9
  stone: Stevenson, J.J. 5
    Johnstown quadrangle: Phalen, W.C. 3, 4
    Latrobe quadrangle: Campbell, M.R. 6

Ground water
  Greensburg quadrangle: Johnson, M.E. 8
  Pittsburgh quadrangle: Johnson, M.E. 9
  Westmoreland Co.: Piper, A.M. 1

Historical geology
  Devonian-Mississippian, Freeport quadrangle: Hughes, H.H. 1
  Devonian-Pennsylvanian: White, I.C. 25
    Johnstown quadrangle: Phalen, W.C. 3, 4

    - Ligonier Valley: Stevenson, J.J. 5
    - Somerset quadrangle: Richardson, G.B. 11
  - Mississippian-Pennsylvanian: Stevenson, J.J. 5
    - western: Stevenson, J.J. 4
  - Mississippian-Pleistocene
    - Connellsville quadrangle: Campbell, M.R. 2
    - Latrobe quadrangle: Campbell, M.R. 6
  - Pennsylvanian: D'Invilliers, E.V. 6; Grabau, A.W. 2; Raymond, P.E. 1
    - New Kensington quadrangle: Richardson, G.B. 9
    - Pittsburgh area: Leighton, H. 8
    - Pittsburgh quadrangle: Johnson, M.E. 9
    - Upper Freeport coal: Rayburn, J.M. 1

Maps
  - Economic
    - coal, bituminous: Hogg, J.B. 1; Wall, J.S. 1
    - coal mines: Platt, F. 3
    - Connellsville quadrangle, mineral resources: Campbell, M.R. 2
    - Greensburg quadrangle, mineral resources: Johnson, M.E. 8
    - Johnstown quadrangle, mineral resources: Phalen, W.C. 3, 4
    - Latrobe quadrangle, mineral resources: Campbell, M.R. 6
    - petroleum and gas
      - Freeport quadrangle: Hughes, H.H. 1
      - Greensburg quadrangle: Johnson, M.E. 8
      - Pittsburgh quadrangle: Johnson, M.E. 9
    - Pittsburgh quadrangle, mineral resources: Johnson, M.E. 9
    - Somerset quadrangle, mineral resources: Richardson, G.B. 11
  - Geologic: D'Invilliers, E.V. 9; Lesley, J.P. 46, 47; Stevenson, J.J. 5
    - Connellsville quadrangle: Campbell, M.R. 2
    - Freeport quadrangle: Hughes, H.H. 1
    - Greensburg quadrangle: Johnson, M.E. 8
    - Johnstown quadrangle: Phalen, W.C. 3
    - Latrobe quadrangle: Campbell, M.R. 6
    - Pittsburgh quadrangle: Johnson, M.E. 9
    - Somerset quadrangle: Richardson, G.B. 11
    - western: Stevenson, J.J. 4
  - Structure
    - Connellsville quadrangle: Campbell, M.R. 2
    - Latrobe quadrangle: Campbell, M.R. 6
    - Somerset quadrangle: Richardson, G.B. 11
  - Structure contour
    - Connellsville quadrangle, Pittsburgh coal: Campbell, M.R. 2
    - Freeport quadrangle, Upper Freeport coal: Hughes, H.H. 1
    - Greensburg quadrangle, Pittsburgh coal: Johnson, M.E. 1
    - Johnstown quadrangle, Lower Kittanning coal: Phalen, W.C. 3, 4
    - Latrobe quadrangle
      - Pittsburgh coal: Campbell, M.R. 6
      - Pottsville sandstone, Pennsylvanian: Campbell, M.R. 6
    - Pittsburgh quadrangle, Pittsburgh coal: Johnson, M.E. 9
    - Somerset quadrangle
      - Johnstown limestone, Pennsylvanian: Richardson, G.B. 11
      - Lower Kittanning coal: Richardson, G.B. 11

Mineralogy
  - calcite: Hamilton, H.V. 1
  - goethite: Hamilton, H.V. 1
  - hematite: Hamilton, H.V. 1
  - sphalerite: Hamilton, H.V. 1

Paleontology
  - amphibian, Pennsylvanian: King, A.T. 3
  - birds, Pennsylvanian: King, A.T. 1; Lyell, C. 3
  - mammals, Pennsylvanian: King, A.T. 1, 2; Lyell, C. 3
  - Pennsylvanian, Pottsville fauna: Hall, C.E. 5
  - plants, Pennsylvanian: King, A.T. 5
  - reptiles, Pennsylvanian: King, A.T. 1; Lyell, C. 3, 4

Physical geology
  - Bellevernon anticline: Robinson, J.F. 2
  - Pittsburgh coal, fracture patterns: Wasmuth, H.A. 2
  - structure: D'Invilliers, E.V. 6; Sisler, J.D. 16; Stevenson, J.J. 4
    - Greensburg quadrangle: Johnson, M.E. 1

Physiography
  - terraces, Pleistocene: Stevenson, J.J. 5

WILLIAMSITE
  - Chester Co.: Hermann, R. 2
  - Lancaster Co.: Shepard, C.U. 2; Silliman, B., Jr. 2

WIND GAPS, *see* Water and wind gaps

WOLLASTONITE
- Bucks Co.: Morton, S.G. 1

WORMS
- Berks Co., Cambrian: Haldeman, S.S. 1; Howell, B.F. 2
- Central, conularids, Ordovician-Devonian: Richardson, E.S. 1
- Franklin Co., Cambrian: Cloud, P.E. 1
- Huntingdon Co., Devonian: Vokes, H.E. 1
- Juniata Co.
  - Devonian: Howell, B.F. 9
- Silurian: Howell, B.F. 1
- Lancaster Co., Cambrian: Haldeman, S.S. 1; Resser, C.E. 3; Ruedemann, R. 3
- Lehigh Co., Cambrian: Miller, B.L. 38
- Luzerne Co., Pennsylvanian: Miller, S.A. 3
- Northampton Co., Cambrian: Howell, B.F. 4; Miller, B.L. 38
- Pennsylvania, Cambrian: Hitchcock, C.H. 2
- Pennsylvania, conularids, Devonian: Swartz, F.M. 14
- Perry Co., Devonian: Howell, B.F. 9
- Southeastern, Cambrian: James, J.F. 1; Lewis, H.C. 41
- York Co.
  - structural distortion: Wanner, A. 2
  - Triassic: Wanner, H.E. 1

WULFENITE
- Chester Co.: Koch, S. 1; Schrauf, A. 1; Smith, J.L. 1; Wetherill, C.M. 2
- Montgomery Co.: Boucot, A.J. 1

WYOMING COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Northeastern

Areal geology
- Wyoming Co.: White, I.C. 12
- Wyoming valley: Jones, T.H. 1

Economic geology
- coal, anthracite, popular: Maxwell, V.L. 1
- copper: Butler, R.D. 2; White, I.C. 12
- flagstone: Stone, R.W. 19
- lead: White, I.C. 12
- zinc: White, I.C. 12

Ground water
- Wyoming Co.: Lohman, S.W. 1

Historical geology
- Mississippian-Pennsylvanian boundary: Hill, F.A. 5
- Paleozoic, popular: Maxwell, V.L. 1
- Pennsylvanian: Read, C.B. 1
- Silurian-Mississippian: White, I.C. 12

Maps
- Geologic: Lesley, J.P. 46, 47; White, I.C. 11, 12

Paleontology
- crustaceans, Devonian: Claypole, E.W. 7
- fish, Devonian: Newberry, J.S. 4
- plants
  - Devonian: Arnold, C.A. 5, 9; Dawson, J.W. 2, 3
  - Pennsylvanian: Read, C.B. 1

Physiography
- buried valleys, Susquehanna River: Corss, F. 3; Griffith, W. 1
- glacial geology: Branner, J.C. 4; Ross, W.A. 1; White, I.C. 12
- gorges: Davis, W.M. 2
- potholes, Susquehanna River: Corss, F. 1
- striae: Branner, J.C. 5; Corss, F. 4

XENOTIME, *see also* Radioactive minerals
- Delaware Co.: Wherry, E.T. 2
- Philadelphia Co.: Wherry, E.T. 2

YORK COUNTY, *see also* Pennsylvania, Pennsylvania-Eastern, and Pennsylvania-Southeastern
- magnetic survey, Dillsburg area: Neumann, G.L. 1
- meteorites: Farrington, O.C. 1; Gordon, S.G. 12

Areal geology
- Hanover-York area: Stose, A.I.J. 1
- McCalls Ferry quadrangle: Jonas, A.I. 5
- McCalls Ferry-Quarryville district: Knopf, E.F.B. 4
- Middletown quadrangle: Stose, G.W. 33
- York Co.: Demming, H.C. 1; Frazer, P. 36; Stose, G.W. 39

Economic geology
- clay: Stose, G.W. 39
  - Hanover-York area: Stose, A.I.J. 1
- copper: Frazer, P. 19, 37; Jandorf, M.L. 2; Stose, G.W. 39
- garnet: Stose, G.W. 39
- iron: Frazer, P. 20, 37; Harder, E.C. 1, 3; Neumann, G.L. 1; Stose, G.W. 39
  - Bender mine: Spencer, A.C. 2
  - Blue Ridge area: Frazer, P. 13
  - Dillsburg area: Spencer, A.C. 2
  - Grantham-Jones mines: Spencer, A.C. 2
  - Hanover-York area: Stose, A.I.J. 1
  - Middletown quadrangle: Stose, G.W. 33
  - mines: D'Invilliers, E.V. 8
  - origin: Frazer, P. 7, 15
  - Triassic: Frazer, P. 19

    - Wellsville area: Spencer, A.C. 2
  - kaolin: Leighton, H. 7
  - lead: Miller, B.L. 13
  - limestone: Jandorf, M.L. 1; Stose, G.W. 39
    - Hanover-York area: Stose, A.I.J. 1
    - Middletown quadrangle: Stose, G.W. 33
    - quarries: D'Invilliers, E.V. 8
  - manganese: Miller, B.L. 7
  - roofing granules: Stone, R.W. 20
  - sand: Stose, G.W. 39
    - Hanover-York area: Stose, A.I.J. 1
    - Middletown quadrangle: Stose, G.W. 33
  - slate: Behre, C.H. 9; Dale, T.N. 2; Ferguson, E.G.W. 1; Stose, G.W. 39
    - Hanover-York area: Stose, A.I.J. 1
    - Peach Bottom area: Knopf, E.F.B. 4
  - stone: Stose, G.W. 39
    - Hanover-York area: Stose, A.I.J. 1
  - zinc: Miller, B.L. 13

Historical geology
- Cambrian: Resser, C.E. 3; Walcott, C.D. 5
- Cambrian-Ordovician: Stose, G.W. 18
- Cambrian-Tertiary, Middletown quadrangle: Stose, G.W. 33
- Ordovician, Peach Bottom area: Frazer, P. 28, 35
- Precambrian-Ordovician: Mathews, E.B. 1
  - McCalls Ferry quadrangle: Knopf, E.F.B. 4
- Precambrian-Tertiary: Frazer, P. 13; Stose, G.W. 39
  - Middletown quadrangle: Stose, G.W. 33
- Precambrian-Triassic: Demming, H.C. 1; Frazer, P. 37; Hickok, W.O. 8
  - Hanover-York quadrangles: Stose, A.I.J. 1
  - McCalls Ferry quadrangle: Jonas, A.I. 5
- Triassic: Bissell, M.H. 1; Frazer, P. 6
  - faulting: Stose, G.W. 47

Maps
- Economic
  - iron: D'Invilliers, E.V. 8; Frazer, P. 20
    - Dillsburg area: Frazer, P. 20
  - mines: Frazer, P. 13; McCreath, A.S. 5
  - limestone: D'Invilliers, E.V. 8; Jandorf, M.L. 1; Swain, F.M. 2
- Geologic: Frazer, P. 29, 37; Lesley, J.P. 46, 47; Stose, G.W. 39
  - Dillsburg area: Spencer, A.C. 2
  - Hanover-York area: Stose, A.I.J. 1
  - McCalls Ferry-Quarryville district. Knopf, E.F.B. 4
  - Middletown quadrangle: Stose, G.W. 33
  - Peach Bottom slate area: Behre, C.H. 9
  - Triassic diabase: Stose, G.W. 15

Mineralogy
- augite: Ehrenfeld, C.H. 3
- chabazite: Ehrenfeld, C.H. 3
- fluorite: Ehrenfeld, C.H. 1
- garnet: Stose, G.W. 38
- limonite pseudomorphs: Holden, E.F. 1
- mineral localities: Jandorf, M.L. 1
- quartz: Frazer, P. 12
- sphalerite: Ehrenfeld, C.H. 3; Jandorf, M.L. 3
- stilbite: Ehrenfeld, C.H. 2, 3

Paleontology
- algae
  - Ordovician, Peach Bottom slate: Frazer, P. 35
  - Triassic: Wanner, A. 1
- brachiopods, Cambrian: Walcott, C.D. 9
- Cambrian fauna: Jandorf, M.L. 1; Resser, C.E. 3
- crustaceans, Triassic: Wanner, H.E. 1, 2
- dinosaurs, Triassic: Hickok, W.O. 4; Hitchcock, C.H. 10; Wanner, A. 1; Willard, B. 54
  - popular: Ashley, G.H. 82
- fish, Triassic: Wanner, H.E. 1
- fucoid, Ordovician, Peach Bottom area: Lesley, J.P. 32
- gastropods, Triassic: Wanner, H.E. 1
- graptolites, Ordovician, Peach Bottom slate: Hall, C.E. 6
- ostracodes, Triassic: Wanner, H.E. 1
- pelecypods, Triassic: Wanner, H.E. 1, 2
- plants, Triassic: Wanner, A. 3
- reptile, Triassic: Sinclair, W.J. 2; Wanner, H.E. 1, 2
- trilobites, Cambrian: Wanner, A. 4
- worms, Triassic: Wanner, H.E. 1

Petrology
- diabase: Frazer, P. 5; Stose, G.W. 15
  - from baked sandstone: Frazer, P. 11
- hydromica slate: Frazer, P. 1
- igneous rocks: Ehrenfield, F. 1
- intraformational conglomerate: Walcott, C.D. 7
- limestone, analyses: Frazer, P. 10

Physical geology
- creep examples: Wickersham, W. 1
- faults: Frazer, P. 4
  - Triassic: Stose, G.W. 47
- recumbent folding: Jonas, A.I. 15

- structure: Jonas, A.I. 12
- worm-tube flattening: Wanner, A. 2

Physiography

- terraces, Susquehanna River: Mackin, J.H. 1

ZARATITE

- Lancaster Co.: Silliman, B., Jr. 1; Slavik, F. 1; Smith, J.L. 1

ZEOLITES

- analcite
  - Lebanon Co.: Eyerman, J. 1
  - Philadelphia Co.: Foote, A.E. 1
- Berks Co.: Barton, B.S. 2
- chabazite
  - Berks Co.: Sadtler, B. 1; Smith, E.F. 4; Thomas, C.A. 5
  - Delaware Co.: Palmer, L. 1
  - Montgomery Co.: Haeberle, W.F. 1
  - York Co.: Ehrenfeld, C.H. 3
- Chester Co.: Eyerman, J. 6
- Delaware Co.: Koenig, G.A. 5
- epidesmine
  - Berks Co.: Gordon, S.G. 2
  - Montgomery Co.: Thomas, C.A. 2
- harmotome, Delaware Co.: Meier, A.E. 1, 2, 3
- heulandite
  - Berks Co.: Rand, T.D. 26; Thomas, C.A. 5
  - Delaware Co.: Koenig, G.A. 3
  - Lancaster Co.: Knerr, E.B. 1
- laumontite, Berks, Co.: Rand, T.D. 26; Smith, E.F. 4; Thomas, C.A. 5
- Montgomery Co.: Thomas, C.A. 7; Wherry, E.T. 6
- Philadelphia Co.: Silliman, B. 1
- stilbite
  - Berks Co.: Brunner, D.B. 1; Davidson, F.P. 1; Hoskinson, W.S. 1; Thomas, C.A. 5
  - Chester Co.: Eyerman, J. 2
  - Lehigh Co.: Smith, E.F. 2
  - Montgomery Co.: Haeberle, W.F. 1
  - York Co.: Ehrenfeld, C.H. 2, 3

ZINC, *see also* zinc-bearing minerals

- Blair Co.: Platt, F. 15; Zeller, R.A. 3
  - Sinking Valley area: Miller, B.L. 8; Myers, W.M. 2; Reed, D.F. 1
  - Tyrone quadrangle: Butts, C. 18
- Bucks Co.: Bayley, W.S. 2
  - Allentown quadrangle: Miller, B.L. 14
  - New Galena area: Miller, B.L. 9
- Centre Co.
  - Bellefonte area: Myers, W.M. 2
  - Bellefonte quadrangle: Butts, C. 16
  - Tyrone quadrangle: Butts, C. 18
- Chester Co.: Woodhouse, J. 2
  - Phoenixville area: Miller, B.L. 11
  - Phoenixville quadrangle: Bascom, F. 21
  - Pickering Creek area: Reed, D.F. 2
- Fayette Co.: Stevenson, J.J. 5
- Huntingdon Co., Tyrone quadrangle: Butts, C. 18
- Lancaster Co.: Landis, D.B. 1; Miller, B.L. 10
  - Bamford mine: Mosier, M. 1
  - Lancaster quadrangle: Jonas, A.I. 10
- Lehigh Co.: Clerc, F.L. 1; DeLury, J.S. 1; Drinker, H.S. 1; Fraser, D.M. 3; Miller, B.L. 44; White, C.B. 1
  - Allentown quadrangle: Miller, B.L. 14
  - Friedensville area: Miller, B.L. 12
  - plant indicators: Robinson, W.O. 1
  - popular: Blank, E.W. 1; Stone, R.W. 51
- Montgomery Co., Phoenixville area: Miller, B.L. 11
- Northampton Co.: Bayley, W.S. 2
  - Allentown quadrangle: Miller, B.L. 14
- Pennsylvania: Ashley, G.H. 76; Miller, B.L. 13
  - analyses: McCreath, A.S. 3
- Southeastern: Anon. 2; Frazer, P. 31; Freeman, L. 1; Talmage, S.B. 1
- Wyoming Co.: White, I.C. 12

ZINCITE

- Chester Co.: Thomas, C.A. 4
- (melaconite)
  - Adams Co.: Eyerman, J. 1
  - Berks Co.: Thomas, C.A. 5

ZIRCON

- Berks Co.: Smith, S. 1; Wetherill, C.M. 1
- Bucks Co.: Genth, F.A. 16; Morton, S.G. 1; Wherry, E.T. 2
- Chester Co., Honeybrook uplift: Dryden, A.L. 4
- Lehigh Co.: Smith, E.F. 2
- Montgomery Co.: Gehman, G.W. 1
- Philadelphia Co.: Carpenter, G.W. 1

ZOISITE

- Chester Co.: Wherry, E.T. 23
- Delaware Co.: Koenig, G.A. 3
- (unionite), Chester Co.: Silliman, B., Jr. 3; Smith, J.L. 1